

# South High Community School

170 Apricot Street, Worcester, MA 01603

## MSBA

## Site Enabling Bid Package #1



APRIL 12, 2018

### MSBA

Massachusetts School Building Authority  
40 Broad Street, Suite 500, Boston, MA 02111

### OWNER

City of Worcester, MA  
City Hall, 455 Main Street, Worcester, MA 01608

### OPM

CBRE | HEERY Project Management  
80 Blanchard Road, Suite 108, Burlington, MA 01803

### DESIGNER

Lamoureux Pagano & Associates, Inc.  
108 Grove Street, Suite 300, Worcester, MA 01605

### CONSTRUCTION MANAGER

Fontaine Bros., Inc.  
12 East Worcester Street, Suite 2A  
Worcester, MA 01604

### W.T. Rich Company, Inc.

29 Crafts Street, Suite 300  
Newton, MA 01604

Prepared by:



**LAMOUREUX · PAGANO**  
ARCHITECTS PROJECT MANAGERS





PROJECT DIRECTORY

**OWNER**

Massachusetts School Building Authority  
40 Broad Street, Suite 500  
Boston, Massachusetts 02111

City of Worcester  
City Hall  
455 Main Street  
Worcester, Massachusetts 01608

**CONSTRUCTION MANAGER**

Fontaine Brothers, Inc.  
510 Cottage Street  
Springfield, Massachusetts 01104

**OWNER'S PROJECT MANAGER**

CBRE/Heery International  
80 Blanchard Road, Suite 108  
Burlington, Massachusetts 01803

**ARCHITECT**

Lamoureux Pagano Associates  
108 Grove Street, Suite 300  
Worcester, Massachusetts 01605

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**CONSULTANTS**

**GEOTECHNICAL ENGINEERING**

Lahlaf Geotechnical Consulting  
23 McGuinness Way  
Billerica, Massachusetts 01821

**LANDSCAPE ARCHITECTS**

Studio 2112  
840 Summer Street, Suite 102  
Boston, Massachusetts 02127

**SITE SURVEY & CIVIL ENGINEERING**

Nitsch Engineering  
2 Center Plaza, Suite 430  
Boston, Massachusetts 02108

**HARDOUS MATERIALS CONSULTANT**

Universal Environmental Consultants  
12 Brewster Road  
Framingham, Massachusetts 01782

**SUSTAINABLE DESIGN CONSULTANTS**

The Green Engineer  
54 Junction Square Drive, Suite 102  
Concord, Massachusetts 01742

**STRUCTURAL ENGINEERING**

Bolton & DiMartino, Inc.  
100 Grove Street #317  
Worcester, Massachusetts 01608

**LIBRARY/MEDIA CONSULTANT**

Lamoureux Pagano & Associates  
108 Grove Street, Suite 300  
Worcester, Massachusetts 01605

**EDUCATIONAL PROGRAMMING &  
LABORATORY CONSULTANT**

NESDEC  
28 Lord Street  
Marlborough, Massachusetts 01752

**ACOUSTICAL & THEATER CONSULTANT**

Cavanaugh Tocci Associates  
327 F Boston Post Road  
Sudbury, Massachusetts 01776

**FOOD SERVICE CONSULTANT**

Colburn & Guyette Foodservice Design  
Consulting  
100 Ledgewood Place, Suite 104  
Rockland, Massachusetts 02370

**SECURITY CONSULTANT**

ART Engineering Corp.  
38 Front Street, 3<sup>rd</sup> Floor  
Worcester, Massachusetts 01608

**FIRE PROTECTION ENGINEERING**

Sensible Solutions  
64 Knightly Road  
Hadley, Massachusetts 01035

**MECHANICAL & PLUMBING  
ENGINEERING**

Seaman Engineering Corp.  
22 West Street, Unit C  
Millbury, Massachusetts, 01527

**ELECTRICAL, COMMUNICATIONS &  
TECHNOLOGY ENGINEERING**

ART Engineering Corp.  
38 Front Street, Floor 3  
Worcester, Massachusetts 01608

**FURNITURE AND FIXTURES  
CONSULTANT**

Blueline Design  
The Amherst Building  
34 Main Street  
Amherst, MA 01002

**ACCESSIBILITY/CODE CONSULTANT**

R.W. Sullivan Engineering  
529 Main Street, Suite 203  
Boston,

**COST ESTIMATING CONSULTANT**

A.M. Fogarty & Associates  
175 Derby Street, Suite 5  
Hingham, Massachusetts 02043

**SPECIFICATIONS CONSULTANT**

**Wil-Spec LLC**  
375 Main Street  
Boxford, Massachusetts 01921

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South High Community School  
170 Apricot Street  
Worcester, Massachusetts 01603

**Lamoureux Pagano Associates**

Architect of Record

**Bolton & DiMartino, Inc.**

Structural Engineer

**Sensible Solutions**

Fire Protection Engineer

**Seaman Engineering Group**

Plumbing Engineer

**Seaman Engineering Group**

HVAC Engineer

**ART Engineering Corp.**

Electrical Engineer

**Nitsch Engineering**

Civil Engineer

**Studio 2112**

Landscape Architect

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Document 00 01 15  
LIST OF DRAWINGS

**EXISTING SITE**

| Sheet Number | Sheet Title              |
|--------------|--------------------------|
| EEX1.0       | Existing Conditions Plan |

**LANDSCAPE**

| Sheet Number | Sheet Title    |
|--------------|----------------|
| L-E-1.0      | Landscape Plan |

**CIVIL**

| Sheet Name | Sheet Title                            |
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| EC7.1      | Civil Enabling Details                 |

**ELECTRICAL**

| Sheet Name | Sheet Title                        |
|------------|------------------------------------|
| EP1        | Electrical Temporary Lighting Plan |

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Document 00 31 32  
GEOTECHNICAL DATA

1.1 SUMMARY

- A. Subsurface soil investigations have been made and findings are indicated on the following pages. This report entitled "Geotechnical Report – Proosed Worcester South High School", dated April 9, 2018 was prepared by Lahlaf Geotechnical Consulting, Inc. and is bound herewith as Appendix A.
- B. The data contained herein is for general information. The Contractor is required to read the soils report and visit the site to determine the character of the materials to be encountered. The Architect and Owner will not assume responsibility for variations in subsoil quality or condition.

1.2 CONTENTS

- A. The attached 197 pages include as part of this document the following:
  - 1. Report Letter
  - 2. Project Information
  - 3. Site and Subsurface Conditions
    - a. Subsurface Conditions
      - 1) Soil Borings
      - 2) Test Pits
    - b. Groundwater
    - c. Double Ring Infiltrometer Tests
    - d. Laboratory Test Data
  - 4. Evaluation and Recommendations
  - 5. Construction Considerations
  - 6. Future Work
  - 7. Report Limitations
  - 8. References

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Document 00 43 96  
COMPANY INFORMATION  
(Bid Form Attachment)

The following information is furnished by the bidder for the information of the Awarding Authority:

If a Corporation:

Incorporated in what state .....

President: .....

Treasurer: .....

Secretary: .....

If a foreign corporation [incorporated or organized under laws other than laws of the Commonwealth of Massachusetts], is the corporation registered with the Secretary of State of Massachusetts? Yes....., No.....

If the bidder is selected for the work referred to above, it is required under Massachusetts General Laws (MGL) Chapter 30 Section 39L to furnish to the Awarding Authority a certificate of the Secretary of State stating that the corporation has complied with all applicable requirements set forth in the General Laws of the Commonwealth of Massachusetts.

If a Partnership: [Name All Partners]

Name of Partner: .....

Residence .....

Name of Partner: .....

Residence .....

If an Individual doing business under a firm name:

Name of Firm: .....

Name of Individual: .....

Business Address: .....

Residence: .....

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Document 00 45 19  
NON-COLLUSION AFFIDAVIT

The undersigned, being first duly sworn, deposes and says that:

(1) He is \_\_\_\_\_ of \_\_\_\_\_, the Bidder that has submitted the attached Bid; is fully respecting the preparation and contents of the attached Bid and of all pertinent circumstance respecting such Bid; and such Bid is genuine and is not a collusive or sham Bid;

(2) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Owner, or any person interested in the proposed Contract; and

(3) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

(4) The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used herein, the word person shall mean any natural person, joint venture, partnership, corporation or other business or legal entity; and

(5) The undersigned also hereby certifies under the penalties of perjury that no person acting for, or employed by, the Commonwealth of Massachusetts, the Massachusetts School Building Authority or the City of Worcester is directly or indirectly interested in this proposal, or in any contract which be made under it, or in expected profits to arise therefrom.

Signature: \_\_\_\_\_

Name of Person signing bid: \_\_\_\_\_

Name of Business: \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 2018

(Title)

My commission expires \_\_\_\_\_

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## AFFIDAVIT OF COMPLIANCE

---

\_\_\_\_\_Massachusetts Business Corp.    \_\_\_\_\_Foreign Corp.    \_\_\_\_\_Non-Profit Corp.

I, \_\_\_\_\_, President    \_\_\_\_\_ Clerk \_\_\_\_\_of

\_\_\_\_\_, principal office is located at \_\_\_\_\_

\_\_\_\_\_

I do hereby certify that the above named corporation has filed with the State Secretary all certificates and annual reports required by Chapter 156B Sec. 109 (business corporation), by Chapter 181, Sec. 4 (foreign corporation) or by Chapter 180, Sec. 26A (non-profit corporation) of the Massachusetts General Laws.

SIGNED UNDER THE PENALTIES OF PERJURY this \_\_\_\_\_day of \_\_\_\_\_, 200\_.

\_\_\_\_\_  
Signature of Responsible Corporate Officer

**AFFIDAVIT OF PREVAILING WAGE COMPLIANCE (C. 149, S. 26 AND 27) and Davis Bacon Wages**

I, \_\_\_\_\_, \_\_\_\_\_, of the  
Name Title

\_\_\_\_\_, with a principal office is located at \_\_\_\_\_  
Offeror's Company Name

do hereby certify that the above named corporation will comply with the prevailing wage laws as set forth in Sections 26 and 27 of the Massachusetts General Laws.

SIGNED UNDER THE PENALTIES OF PERJURY this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Signature of Duly Authorized Officer

Document 00 63 13  
REQUEST FOR INTERPRETATION (RFI) FORM

Date Submitted: \_\_\_\_\_

To the Architect:

Lamoureux Pagano & Associates  
108 Grove Street  
Worcester, Massachusetts 01605

Architect's Assigned  
RFI #

Architect's Project Number: \_\_\_\_\_

Submitted By: \_\_\_\_\_

Company: \_\_\_\_\_

Address \_\_\_\_\_

References: \_\_\_\_\_

Specification Section Number: \_\_\_\_\_

Article/ Paragraph / Subparagraph: \_\_\_\_\_

Drawing Number: \_\_\_\_\_

Detail Number: \_\_\_\_\_

Request: \_\_\_\_\_

☐ Refer to Attachment(s)

Signed By: \_\_\_\_\_

Response: \_\_\_\_\_

☐ Refer to Attachment(s)

Response From: \_\_\_\_\_

Signed by: \_\_\_\_\_

Copies to:

☐ Owner

☐ Consultants

☐ \_\_\_\_\_

☐ \_\_\_\_\_

☐ \_\_\_\_\_

☐ \_\_\_\_\_

☐ \_\_\_\_\_

☐ \_\_\_\_\_

☐ File

Date Received at  
Architect

Date Returned by  
Architect

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**SUBSTITUTION REQUEST FORM**

Project: \_\_\_\_\_ Architect's Project Number: \_\_\_\_\_  
\_\_\_\_\_  
Substitution Request Number: \_\_\_\_\_  
To: \_\_\_\_\_ Date: \_\_\_\_\_  
\_\_\_\_\_  
From: \_\_\_\_\_  
Re: \_\_\_\_\_ Contract For: \_\_\_\_\_

---

Section Title: \_\_\_\_\_ Description: \_\_\_\_\_  
Section No.: \_\_\_\_\_ Page: \_\_\_\_\_ Article/Paragraph: \_\_\_\_\_

---

Proposed substitution: \_\_\_\_\_  
Manufacturer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_  
Trade Name: \_\_\_\_\_ Model No./Color: \_\_\_\_\_  
Installer: \_\_\_\_\_ Address: \_\_\_\_\_ Phone: \_\_\_\_\_  
History: ☐ New Product ☐ 1 – 4 years old ☐ 5 – 10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

☐ Point-by-point comparative data attached – REQUIRED BY ARCHITECT

---

Reason for not providing specified item: \_\_\_\_\_  
\_\_\_\_\_

Similar Installation:

Project: \_\_\_\_\_ Architect: \_\_\_\_\_  
Address: \_\_\_\_\_ Owner: \_\_\_\_\_  
\_\_\_\_\_  
Date Installed: \_\_\_\_\_

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Proposed substitution affects LEED v4 requirements of Work:

☐ No  
☐ Yes; specifically identify the credit criteria impacted and demonstrate how the proposed substitution meets the same credit requirements

Savings to Owner for accepting substitution: \_\_\_\_\_ (\$ \_\_\_\_\_).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] \_\_\_\_\_ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests  
☐ Reports ☐ Sustainability ([NE-CHPS][LEED v4]) Criteria

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product including meeting LEED credit requirements, where applicable
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be correct in all respects.

Submitted by: \_\_\_\_\_

Signed by: \_\_\_\_\_

Firm: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: \_\_\_\_\_

Attachments: \_\_\_\_\_

#### ARCHITECT'S REVIEW AND ACTION

- ☐ Substitution approved – Make submittals per Division 01 Section "Substitution Procedures."
- ☐ Substitution approved as noted – Make submittals per Division 01 Section "Substitution Procedures."
- ☐ Substitution rejected – Use specified materials.
- ☐ Substitution Request received too late – Use specified materials.

Signed by: \_\_\_\_\_ Date: \_\_\_\_\_

---

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E  
☐ Other \_\_\_\_\_

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**DOCUMENT 00 72 00**

**CONSTRUCTION MANAGER AT RISK GENERAL  
CONDITIONS OF THE CONTRACT**

**(CITY OF WORCESTER DOCUMENT 00200)**

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## **CONSTRUCTION MANAGER AT RISK CONTRACT**

### **GENERAL CONDITIONS OF THE CONTRACT**

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## **ARTICLE I** **DEFINITION OF TERMS**

The following words shall have the following meanings as used in this Contract:

**Advertisement:**

The Advertisement or Notice Inviting Bids or Proposals for the Work.

**Approval (or Approved):**

An approval in writing signed by the authorized signatory of the City of Worcester.

**Architect:**

The architect identified as the Designer in Article 1 of the Owner-CM Agreement.

**As directed (As permitted, as required, as determined or words of like effect):** The direction, permission, requirement or determination of the City of Worcester unless otherwise stated in the Contract Documents. Similarly, *approved*, *acceptable*, *satisfactory* or words of like import shall mean approved by or acceptable or satisfactory to the Designer and the City of Worcester, except as may be otherwise determined by the City of Worcester.

**Building Code:**

All applicable rules and regulations to which the City of Worcester is subject and which are contained or referenced in the code authorized by M.G.L. c. 143, s. 93 et seq., including all amendments thereto.

**Certificate of Agency Use and Occupancy:**

A certificate signed by the Designer and the City of Worcester pursuant to the requirements of Article VI of these General Conditions of the Contract, indicating that the City of Worcester has determined that (1) the Work has been completed in accordance with the Contract Documents, except for Punch List items, (2) certificates of inspection, testing and/or approval (including a certificate of occupancy under the Building Code), operating permits for any mechanical apparatus which may be required to permit full use and occupancy of the Work by its intended users (which in a Subcontractor's case may include the Contractor) have been delivered to the City of Worcester, (3) any applicable written warranties, operating instructions and related materials have been delivered to the City of Worcester, and (4) the Work may be used for its intended purpose without substantial inconvenience or interference.

**Change Order:**

(1) A written order not requiring the consent of the CM, signed by the Project Manager and designated as a Change Order, directing the CM to make changes in the Work within the general scope of the Contract, or (2) any written or oral order from the Project Manager that causes any change in the Work Provided that the CM has given the City of Worcester written notice stating the date, circumstances, and source of the order and that the CM regards the order as a Change Order.

**Construction Manager, Contractor, CM and General Contractor:**

The person, corporation or other entity with whom the City of Worcester has executed the CM Agreement.

**Construction Manager's Key Personnel:**

The personnel listed in the Construction Manager's Proposal and Sections B.1, C.1, and C.2 of Exhibit GC of the Owner-CM Agreement, all of whom shall be dedicated to the

Project on a full time basis, and which personnel shall include at a minimum the Project Executive, the Project Manager, the Superintendent (who shall be a properly licensed construction supervisor), and the Project Scheduler. Unless otherwise designated by the CM, the Project Executive shall have complete authority to act for the CM.

**Contract:**

The Contract formed by the Contract Documents.

**Contract Documents:**

The documents listed in Article 2 of the Owner-CM Agreement.

**Contract Modification:**

Any alteration of the Contract Documents accomplished by a written agreement properly executed by the parties to this Contract.

**Contract Price:**

The Contract Price constitutes full compensation to the CM for everything to be performed and furnished in connection with the Work and for all damages arising out of the performance of the Work for which the City of Worcester is responsible, and constitutes the maximum compensation regardless of any difficulty incurred by the CM in connection with the Work or in consequence of any suspension or discontinuance of the Work. See also definition of Guaranteed Maximum Price.

**Designer:**

The architect or engineer identified as the Designer in the Preliminary Statement of the Owner- CM Agreement, subject to the provisions of Article III, Section 1 of these General Conditions of the Contract.

**Drawings:**

The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including Plans, elevations, sections, details, schedules, and diagrams.

**Engineer:** The Designer, except that the term "Resident Engineer" shall have the meaning otherwise specified herein.

**Final Acceptance:**

The written determination by the City of Worcester that the Work has been 100% completed, except for the CM's indemnification obligations, warranty obligations, obligations to continue to maintain insurance coverage for the time periods provided in the Contract Documents, and any other obligations which are intended to survive Final Acceptance and/or the termination of the Contract.

**Guaranteed Maximum Price:**

Guaranteed maximum price", or "GMP", is the agreed total dollar amount for the construction management at risk services, including the cost of the work, the general conditions and the fees charged by the construction management at risk firm; also known as the Contract Price.

**Laws:**

All applicable statutes, regulations, ordinances, codes, laws, orders, decrees, approvals, certificates and requirements of governmental and quasi-governmental authorities.

**Neutral:**

An impartial third party not having an interest in the Owner, the Designer, the Program Manager, the CM or the Project.

**Notice to Proceed (NTP):**

The written notice provided by the City of Worcester to the CM which authorizes the CM to commence the Work as of a date specified therein, from which date the times specified in Article 4 of the Owner-CM Agreement is measured. The City of Worcester may issue more than one



NTP, including but not limited to separate NTPs for Preconstruction and Construction Services, in which case the date from which the time for completion of construction is measured shall be as stated in the appropriate NTP.

**Or equal (or words of like import):**

Equal in the opinion of the City of Worcester determined pursuant to the provisions of M.G.L. c.30, s. 39M and the provisions of these General Conditions of the Contract.

**Owner:**

The Commonwealth of Massachusetts or political subdivision thereof, authority, or other instrumentality that will own the Work. This term may also be used interchangeably with the term "the City of Worcester."

**Plan(s):**

Drawing(s).

**Product Data:**

Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the CM or its Subcontractors and suppliers to illustrate materials or equipment for some portion of the Work. Product data shall also include any such information or instructions produced by the manufacturer or distributor of such materials or equipment and made readily available by said manufacturer or distributor.

**Progress Schedule:**

The progress schedule submitted by the CM Approved by the City of Worcester in accordance with the Contract Documents.

**Project:**

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by separate contractors.

**Project Manager:**

The City of Worcester's representative assigned to the Project.

**Punch List:**

A list of items determined by the City of Worcester to be minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the Work for its intended purpose.

**Resident Engineer:**

The on-Site representative of the City of Worcester.

**Samples:**

Samples are physical examples, that illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.

**Schedule of Values:**

The schedule Approved by the City of Worcester pursuant to Article VIII of these General Conditions of the Contract which allocates the Contract Price to the various portions of the Work and is used as a basis for payments to the CM.

**Shop Drawings:**

Drawings, diagrams, details, schedules, and other data specially prepared for the Work by the CM or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate a portion of the Work.

**Site:**

The land and, if any, building(s) or space within any such building(s) on which or in which the CM is to perform the Work.

**Specifications:**

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards, and workmanship for the Work and performance of related services.

**Subcontractor:**

Person or entity with whom the CM or a subcontractor contracts in order to perform the Work, except as otherwise specifically provided or required herein or by Law. "Subcontractor" when used also means "Trade Contractor" except when otherwise specified.

**Substantial Completion:**

"Substantial completion" shall occur when (1) the CM fully completes the Work or substantially completes the Work so that the value of the Work remaining to be done is, in the estimate of the City of Worcester, less than one percent of the adjusted contract price, or (2) the CM substantially completes the work and the City of Worcester takes possession for occupancy, whichever occurs first.

**Superintendent:**

The licensed construction supervisor who is an employee of the CM designated to be in full time attendance at the Site throughout the prosecution and progress of the Work and who shall have complete authority to act for the CM.

**Trade Contractor:**

Subcontractors under Contract with the CM to perform the work of the trades listed in paragraph 1.1 of the Procedures for Award of Subcontracts at Appendix C, and selected under the process authorized in M.G.L. c. 149A and Section I of the aforementioned Procedures by the CM. Sometimes referred to as "Filed Subcontractor" or "Filed Subbidder."

**Work:**

The Work consists of all the work identified in the Contract Documents. The Work comprises the completed construction required by the Contract Documents and includes all labor, tools, materials, supplies, equipment, permits, approvals, paperwork, calculations, submittals, and certificates necessary to develop, construct and complete the Work in accordance with all Laws, and all construction and other services required to be supervised, overseen, performed or furnished by CM or that the Contract Documents require the CM to cause to be supervised, overseen, performed or furnished. The CM shall provide and perform for the Contract Price all of the duties and obligations set forth in the Contract Documents.

All terms that this Contract defines may be used with or without initial capital letters. Other terms, abbreviations and references are defined as they appear herein. Words and abbreviations that are not defined in the Contract Documents but which have recognized technical or trade meanings are used in accordance with those meanings. For additional definitions of terms, abbreviations and references refer to the *General Requirements, or Specifications*.

## **ARTICLE II**

### **EXECUTION OF THE CONTRACT, SCOPE OF WORK, INTERPRETATION OF CONTRACT DOCUMENTS, DISTRIBUTION OF WORK, SUBCONTRACTS**

#### **1. Execution**

The execution of the Owner – CM Agreement by the CM is a representation that the CM has visited the Site, has become familiar with local conditions under which the Work is to be performed and has correlated observations at the site with requirements of the Contract Documents.

#### **2. Scope of Work**

The Work consists of all the work identified in the Contract Documents. The Work comprises the completed construction required by the Contract Documents and includes all labor, tools, materials, supplies, equipment, permits, approvals, paperwork, calculations, submittals, and certificates necessary to develop, construct and complete the Work in accordance with all Laws, and all construction and other services required to be supervised, overseen, performed or furnished by CM or that the Contract Documents require the CM to cause to be supervised, overseen, performed or furnished. The CM shall provide and perform for the Contract Price all of the duties and obligations set forth in the Contract Documents.

#### **3. Interpretation**

A. The Plans and Specifications and other Contract Documents are to be considered together and are intended to be mutually complementary, so that any work shown on the Plans though not specified in the Specifications, and any work specified in the Specifications though not shown on the Plans, is to be executed by the CM as a part of this Contract. Should a conflict occur in or between or among any parts of the Contract Documents that are entitled to equal preference, the better quality or greater quantity shall govern, unless the City of Worcester directs otherwise. Figured dimensions shall take precedence over scaled dimensions.

B. All things that in the opinion of the City of Worcester may be reasonably inferred from the Plans, Specifications and other Contract Documents are to be executed by the CM. The Designer shall determine whether the detail Plans conform to the general Plans and Contract Documents, except as may be otherwise determined by the City of Worcester.

C. The tables of contents, titles, headings and marginal notes or sub-scripts contained herein are solely to facilitate references, are not intended to be construed as provisions of the Contract, and in no way affect the interpretation of the provisions to which they refer.

D. Where reference is made in the Contract Documents to publications, standards, or codes issued by associations or societies, such reference shall be interpreted to mean the current edition of such publications, standards, or codes, including revisions in effect on the date of the issuance of the RFP for the contract notwithstanding any reference to a particular date. The foregoing sentence shall not apply to the dates, if any, specified with respect to insurance policy endorsement forms.

**E.** In case of any conflict among the Contract Documents, unless the context clearly otherwise requires, the Contract Documents shall be construed according to the following priorities:

- First Priority: Contract Modifications and Change Orders
- Second Priority: Owner-CM Agreement as amended
- Third Priority: General and Supplementary Conditions of the Contract as amended
- Fourth Priority: Drawings as amended -- Schedules take precedence over enlarged detail Drawings, and enlarged Detail Drawings take precedence over reduced scale Drawings; figured dimensions shall prevail over scale.
- Fifth Priority: Specifications as amended
- Sixth Priority: Request for Proposals as amended
- Seventh Priority: CM's Proposal as amended

**F.** The CM shall refer to all of the Drawings, and to all of the sections of the Specifications, and shall perform all work reasonably inferable therefrom as being necessary to produce the indicated results. Neither the City of Worcester nor the Designer assumes any liability arising out of jurisdictional issues raised or claims advanced by Subcontractors, trade organizations or other interested parties based on the arrangement or manner of subdivision of the content of the Specifications and Drawings. In the event of any claim arising out of any duplication, conflict, inconsistency or discrepancy within the Specifications or on the Drawings as to the allocation of the Work among the Subcontractors the CM shall be solely responsible for resolving the claim and shall be responsible for ensuring that all of the Work is completed, regardless of where it appears in the Specifications or on the Drawings.

#### **4. Distribution of Work**

Other than as required by M.G.L. c. 149A and any other applicable provisions of the Massachusetts General Laws and these Contract Documents, the CM shall be responsible for distributing the Work in the best interests of the Project.

#### **5. Subcontracts**

Procedures for the award of contracts by the CM for the furnishing of labor, materials and equipment in the performance of the Work ("Subcontracts") shall be as specified in the procedures attached hereto as Appendix "C". The CM shall make no substitution for any Subcontractor previously selected without the prior written approval of the City of Worcester. The term Subcontractor also means Trade Contractor except when otherwise specified. The CM shall maintain and periodically update and distribute to the City of Worcester, the Program Manager and the Designer a Project Directory listing the names, addresses and telephone numbers of the principal members of the staff of each Subcontractor. The principal contact and a back-up for each Subcontractor and each of their home telephone numbers, mobile telephone numbers and pager numbers, if available, shall be indicated in the Project Directory so that such persons can be reached in emergency situations occurring beyond regular business hours.

All work shall be performed pursuant to written subcontracts. The CM shall use the Subcontract forms attached hereto in Appendix "D", for all Subcontractors. One form of Subcontract is to be used for all Trade Contractors selected for the trades listed in section 1.1 of the above referenced Procedures, and the other form is to be used for all Other Subcontractors. All subcontracts shall require the Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the CM by the terms of the Contract Documents, and to assume toward the CM all the obligations and responsibilities which the CM, by the Contract Documents, assumes toward the City of Worcester. Each Subcontract shall preserve and protect the rights of the City of Worcester under the Contract Documents with respect to the Work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights. The CM shall require each Subcontractor to enter into similar agreements with its Subcontractors. The CM shall provide to each proposed Subcontractor, prior to the execution of a Subcontract with such Subcontractor, copies of the Contract Documents to which the Subcontractor will be bound by this Paragraph. Each Subcontractor shall provide copies of such Contract Documents to its Subcontractors.

Each Subcontract shall provide that in the event of termination of the Contract due to the default of the CM or for any other reason, the City of Worcester shall have the right (but shall have no obligation) to assume, and/or accept assignment of and further assign to a general contractor or construction manager or other third party who is qualified and has sufficient resources to complete the Work, the rights of the CM under the Subcontract with such Subcontractor. In the event of such assumption or assignment by the City of Worcester, the Subcontractor shall have no claim against the City of Worcester or such third party for work performed by such Subcontractor or other matters arising prior to termination of the Contract, and the City of Worcester or such third party, as the case may be, shall be liable only for obligations to the Subcontractor arising after such assumption or assignment.

No Subcontract, and nothing contained herein or in any Subcontract, shall be construed to create any contractual relationship between any Subcontractor and the City of Worcester.

#### **6. Contract Price**

The Contract Price constitutes full compensation to the CM for everything to be performed and furnished in connection with the Work and for all damages arising out of the performance of the Work for which the City of Worcester is responsible, and constitutes the maximum compensation regardless of any difficulty incurred by the CM in connection with the Work or in consequence of any suspension or discontinuance of the Work.

### **ARTICLE III**

#### **CONTROL OF WORK/ADMINISTRATION OF THE CONTRACT**

##### **1. Designer**

Notwithstanding anything to the contrary expressed or implied in this Contract, any of the powers, rights, and duties of the Designer may be exercised by the City of Worcester, provided that the City of Worcester shall be under no obligation to do so. The City of Worcester may rely

on the Designer for the performance and exercise of its rights and obligations hereunder and shall be presumed to so rely on the Designer in the absence of an explicit written assumption by the City of Worcester of any such rights and obligations, except that any Approval required to be obtained from the City of Worcester hereunder shall not be valid without the signature of the City of Worcester. The City of Worcester may explicitly overrule in writing any action, determination or decision of the Designer should the City of Worcester choose to do so, except to the extent that the same would violate applicable law. Subject to the foregoing, the Designer shall be responsible for the general administration of the Contract and shall perform the duties and exercise the rights herein conferred on the Designer. Except as otherwise specifically provided herein, the Designer shall decide all questions which may arise as to the conduct, quantity, quality, equality, acceptability, fitness, and rate of progress of the several kinds of work and materials to be performed and furnished under this Contract, and shall decide all questions which may arise as to the interpretation of the Plans and Specifications and as to the fulfillment of this Contract on the part of the CM. In the case of the death, resignation, inability or refusal of the Designer to act, or the termination of his or her or its employment, the City of Worcester may appoint another person to act as Designer for the purposes of this Contract. The City of Worcester shall give written notice to the CM of any such appointment.

## **2. Right of Access to Work**

The City of Worcester, the User Agency and the Designer (and persons designated by them) may for any purpose enter upon the Work, the Site, and premises used by the CM, and the CM shall provide safe facilities therefor. Other contractors of the City of Worcester may also enter upon the same for the purposes which may be required by their contracts or work. Any differences or conflicts which may arise between the CM and other contractors of the City of Worcester with respect to their work shall be initially resolved by the Designer.

## **3. Inspection No Waiver**

No inspection by the City of Worcester or the Designer or employees or agents of either of them, and no order, measurement, certificate, approval, payment order, payment, acceptance or any other action or inaction of any of them, shall operate as a waiver by the City of Worcester of any provision of this Contract.

# **ARTICLE IV** **GENERAL PERFORMANCE OBLIGATIONS OF THE CM**

The CM shall complete for the Contract Price all of the Work in a proper, thorough, and workmanlike manner in accordance with the Contract Documents. Without limiting the foregoing and without limiting the CM's obligations under any other provision of the Contract Documents, the CM shall for the Contract Price perform the following general obligations:

**1. Review of Contract Documents and Field Conditions**

A. Before commencing the Work, the CM shall carefully study the Contract Documents and carefully compare all Specifications, Plans, Drawings, figures, dimensions, lines, marks, scales, directions of the Designer, and any other information provided by the City of Worcester and shall at once report to the Designer any questions, errors, inconsistencies, or omissions.

B. Before commencing the Work, the CM shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the CM with the Contract Documents and shall at once report to the Designer any questions, errors, inconsistencies, or omissions.

**2. Supervision and Construction Procedures:**

**Coordination: Cutting and Patching**

A. The CM shall supervise and direct the Work, using the CM's best skill and attention. The CM shall be solely responsible for, and shall have control over, construction means, methods, techniques, sequences and procedures, and shall be responsible for coordinating all portions of the Work under the Contract.

B. The CM shall be responsible for the proper fitting of all Work and the coordination of the operations of all trades, Subcontractors, and materialmen engaged upon the Work. The CM shall guarantee to each of its Subcontractors all dimensions which they may require for the fitting of their work to all surrounding work.

C. All necessary cutting, coring, drilling, grouting, and patching required to fit together the several parts of the Work shall be coordinated by the CM.

D. The CM shall be responsible to the City of Worcester for the acts and omissions of the CM's employees, agents and Subcontractors of all tiers, and their agents and respective contractors employees, and other persons performing portions of the Work or supplying materials therefor.

E. The CM shall be responsible for the inspection of portions of the Work already performed under this Contract to determine that such portions are in proper condition to receive subsequent Work.

F. The CM shall employ a registered land surveyor to perform any engineering required for establishing grades, lines, levels, dimensions, layouts, and reference points for the trades. The CM shall be responsible for maintaining benchmarks and other survey marks and shall replace any benchmarks or survey marks that may have become disturbed or destroyed. The CM shall verify the materials shown on the Drawings before laying out the Work and shall be responsible for any error resulting from its failure to exercise this precaution.

G. Unless otherwise required by the Contract Documents, or directed in writing by the Designer or the City of Worcester, Work shall be performed during regular Working Hours which, unless prescribed otherwise by applicable law, shall be 7:00 a.m. to 5:00 p.m. However, if the CM desires to carry on the Work outside of regular working hours or on Saturdays, Sundays, or Massachusetts or federal holidays then the CM shall provide 48 hours notice to allow satisfactory arrangements to be made for inspecting Work in progress and shall bear the costs of such inspection. the City of Worcester shall bill the CM directly for such costs.

**H.** Work performed outside of regular Working Hours without the consent or knowledge of the Designer and/or the City of Worcester shall be subject to additional inspection and testing as directed by the Designer. The cost of this inspection and testing shall be borne by the CM whether the Work is found to be acceptable or not. The City of Worcester at its election shall be entitled either to issue a credit Change Order to cover such cost or to withhold such cost from any further payments due the CM and/or to receive a payment from the CM of the amount of such cost.

### **3. Key Personnel**

The CM shall employ the Key Personnel as defined in Article I of the General Conditions unless otherwise agreed to by the City of Worcester. The Project Executive shall be the CM's senior person on Site and shall have full authority to accept communications to, make decisions for, and otherwise fully represent the CM in connection with all matters relevant to the Project. The CM's Project Manager(s) shall be responsible for one or more portions of the Work as assigned by the Project Executive. A Project Manager may be the designee of the Project Executive to exercise the Project Executive's responsibilities in the CM's Project Executive's absence. The Superintendent shall be properly licensed in accordance with the Building Code.

### **4. Labor**

**A.** The CM shall employ only competent workers. The CM shall enforce and shall require all its Subcontractors to enforce strict discipline and good order among their respective employees and other persons carrying out the Work. The CM shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. Whenever the Designer or the City of Worcester shall notify the CM in writing that any worker is, in the Designer's opinion, incompetent, unfaithful, disorderly, or otherwise unsatisfactory, such employee shall be discharged from the Work and shall not again be employed on the Project except with the consent of the City of Worcester.

**B.** The CM shall ensure that all its Subcontractors employ a sufficient number of workers to carry on the Work with all proper speed in accordance with Laws, the requirements of the Contract Documents, and the Progress Schedule.

**C.** The CM shall procure materials from such sources and shall manage its own forces and the forces of its Subcontractors in such a manner as will result in harmonious labor relations on the Project Site. The CM shall cause persons to be employed in the Work who will work in harmony with others so employed.

### **5. Notices and Permits**

**A.** The CM at its sole cost shall take out and pay for all approvals, permits, user fees, certificates and licenses required by Laws, pay all charges and fees, and pay for (or cause the appropriate Subcontractor to pay for all utilities required for the proper execution of the Work.

**B.** The CM shall comply with all Laws and shall give all notices required thereby.

**C.** Except as otherwise specified in this Contract, it is not the CM's responsibility to ascertain that the Contract Documents are in accordance with applicable Laws. However, if the CM observes that portions of the Contract Documents are at variance with the requirements of Laws, the CM shall promptly notify the Designer and the City of



Worcester in writing, and necessary changes shall be accomplished by an appropriate Contract Modification.

**D.** If the CM performs Work knowing it to be contrary to Laws without giving such notice to the Designer and the City of Worcester, the CM shall bear full responsibility for such Work and all costs attributable thereto, including, without limitation, corrections to the Work.

**6. Lines, Marks, etc.**

The CM shall furnish batter boards and stakes and shall cause to be placed and maintained thereon so as to be easily read, such lines, marks and directions relating to the Work as the Designer shall from time to time direct. The Designer shall establish base lines and benchmarks on the Drawings for the locations of the Work but all other lines and grades shall be determined by the CM.

**7. Excavation**

The CM shall prevent by sheeting and shoring or bracing, if necessary, any caving or bulging of the sides of any excavation made by the CM, leaving sheeting and shoring in place, or if any is removed, filling solid the spaces left thereby.

**8. Corrections to the Work; Inspection No Bar to Subsequent Corrections**

The inspection of the Work by the Designer, the City of Worcester or its consultants shall not relieve the CM of its responsibilities to fulfill the Contract obligations. Defective work may be rejected by the Designer, the City of Worcester or its consultants whether or not such work and/or materials have been previously overlooked or misjudged by the Designer, the City of Worcester or its consultants and accepted for payment. If the Work or any part thereof shall be found defective at any time before the Final Acceptance of the whole Work, the CM shall forthwith correct such defect in a manner satisfactory to the Designer, the City of Worcester or its consultants. If any material brought upon the Site for use in the Work, or selected for the same, shall be rejected by the Designer, the City of Worcester or its consultants as unsuitable or not in conformity with the Contract Documents, or as damaged by casualty or deteriorated due to improper storage at the Site or to any other factor, the CM shall forthwith remove such materials from the Site. The CM shall pay for the cost of making good all work or property of other contractors or of the Owner destroyed or damaged by such removal or replacement; repair any injury, defect, omission or mistake in the Work as soon as it is discovered, finish and immediately make good any defect, omission or mistake in the Work and complete and leave the Work in perfect condition.

**9. Intentionally Omitted**

**10. Sanitary Facilities**

The CM shall provide and maintain sanitary facilities for all persons employed on the Work, beginning with the first worker at the Site. Said facilities shall meet the following requirements unless otherwise specified in the Supplementary Contract Documents.

**A.** There shall be no fewer facilities than the number required by applicable Laws.

**B.** Facilities shall be kept in a clean sanitary condition at all times and shall be adequately screened to be inaccessible to flies.

**11. Temporary Offices**

**A.** Except as otherwise specified in the Contract Documents, the CM shall erect the following temporary offices near the Site as directed by the Designer and adequately furnish and maintain them in a clean, orderly condition:

- (1) Refer to specification section 01500 Temporary facilities for additional information.

**12. Contract Documents and Samples at the Site**

A reasonable number of sets of Contract Documents will be furnished to the CM by the City of Worcester immediately after signing of the Contract, one of which shall be maintained at the Site for reference by authorized representatives of the City of Worcester. The CM shall maintain at the Site for the use and information of the City of Worcester one record copy of the Drawings, Specifications, Addenda, Change Orders, Approved Shop Drawings, Product Data, Samples, updated Progress Schedule, and all other submittals, all in good order and marked currently to record changes and selections made during construction. These shall be available to the Designer and the City of Worcester and shall be delivered to the Designer for submittal to the City of Worcester upon completion of the Work. The Drawings, Specifications and other documents prepared by the Designer, and copies thereof furnished to the CM, are for use solely with respect to this Project. The CM shall not permit their release to other parties except as may be necessary in dealing with governmental authorities in the ordinary course of permitting and constructing the Project. Further, they are not to be used by the CM or any Subcontractor or Supplier on other projects without the specific written consent of the City of Worcester and the Designer.

**13. Telephones**

The CM shall provide and maintain separate individual telephone service and pay for all calls relating to the Work. Service and equipment shall meet the requirements, if any, of the Contract Documents and shall include provisions for incoming and outgoing calls: (1) in the CM's field office for the use of its authorized agents and (2) in the Resident Engineer's office for the use of the Designer and authorized agents of the City of Worcester.

**14. Safety Laws, Regulations, and Practices**

**A.** The CM shall comply with all health and safety Laws applicable to the Work. Without limitation:

- (1) If the CM uses or stores toxic or hazardous substances it shall comply with M.G.L. c. 111F, s. 2, the "Right to Know" law and regulations promulgated by the Department of Public Health, 105 CMR 670, the Department of Environmental Protection, 310 CMR 33, and the Department of Labor and Workforce Development, 441 CMR 21; and shall post a Workplace Notice obtainable from the Department of Labor and Workforce Development.

- (2) The CM shall comply with the Federal Resource Conservation and Recovery Act, the Federal Comprehensive Environmental Response, Compensation and Liability Act, M.G.L. c. 21C, M.G. L. c. 21E, and any other Laws affecting toxic or hazardous materials, solid, special or hazardous waste (collectively "Hazardous Materials Laws). Should the CM discover unforeseen materials subject to Hazardous Materials Laws at the Site, the CM shall immediately notify the City of Worcester of such discovery.
- (3) The CM shall be responsible for the location of all utilities in connection with the Work. Without limiting the foregoing, the CM shall comply with Dig-Safe Laws. Dig-Safe is the Utility Underground Plant Damage Prevention System, 111 South Bedford Road, Burlington, MA 01803, 1-800-322-4844. The CM shall notify Dig-Safe of contemplated excavation, demolition, or explosive work in public or private ways, and in any utility company right of way or easement, by certified mail, with a copy to Department of Environmental Protection (DEP). This notice shall be given at least 72 hours prior to the work, but not more than sixty days before the work is to be done. Such notice shall state the name of the street or the route number of the way and shall include an accurate description of the location and nature of the proposed work. Dig-Safe is required to respond to the notice within 72 hours of receipt by designating the location of pipes, mains, wires or conduits at the Site. The CM shall not commence work until Dig-Safe has responded. The work shall be performed in such manner and with reasonable precautions taken to avoid damage to utilities under the surface at the work location. The CM shall provide the Superintendent with current Dig-Safe regulations, and a copy of M.G.L. c. 82, s. 40. Any costs related to the services performed by Dig-Safe shall be borne by the CM.
- (4) The CM shall comply with Public Law 92-596, "Occupational Safety and Health Act of 1970" (OSHA), with respect to all rules and regulations pertaining to construction, U.S. Code Title 29, sections 651 et seq. including Volume 36, numbers 75 and 105, of the Federal Register as amended, and as published by the U.S. Department of Labor.
- (5) The CM shall comply with M.G.L. c. 149, s. 129A, relative to shoring and bracing of trenches.

**B.** The CM shall take reasonable precautions to prevent damage, injury or loss to persons or property. Nothing herein shall relieve Subcontractors of their responsibility for the safety of persons and property, and for compliance with all Laws applicable to the Work and their activities in connection therewith. Without limitation, the CM shall take all reasonable precautions for the safety of, and the prevention of injury or damage to (1) all agents and employees and contractors on the Work and all other persons who may be affected thereby including the general public, (2) all the Work and all materials and equipment to be incorporated therein, whether in storage on or off the Site, under the care custody or control of the CM or any of its Subcontractors or any contractors directly or indirectly contracting through any of them, and (3) other property at the Site or adjacent thereto, including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course

of the Work. The CM shall promptly remedy all damage or loss to any such property caused in whole or in part by the CM, any Subcontractor, or anyone directly or indirectly contracted or employed by any of them or by anyone for whose acts any of them may be liable. Without limiting the foregoing, the CM shall:

- (1) post and maintain adequate danger signs and other warnings against hazards;
- (2) promulgate safety regulations and give appropriate notices to the City of Worcester and users of adjacent utilities and property;
- (3) insure the adequate strength and safety of all scaffolding, staging and hoisting equipment, temporary shoring, bracing and tying;
- (4) protect adjoining private or public property;
- (5) provide barricades, temporary fences, and covered walkways required by prudent construction practices, Laws and/or the Contract Documents;
- (6) furnish approved hard hats and other personal protective equipment, furnish approved first aid supplies, furnish the name of the first aid attendant, and maintain a posted list of emergency facilities;
- (7) provide proper means of access to property where the existing access is cut off by the CM;
- (8) maintain from the beginning of any darkness or twilight through the whole of every night sufficient lights on or near any obstruction so as to guard to protect travelers from injury from such obstruction;
- (9) maintain adequate security at the Site so as not to expose the Work and surrounding property to vandalism or malicious mischief;
- (10) provide adequate fire protection procedures during the use of cutting torches, welding equipment, plumbers' torches and other flame and spark producing apparatus; and
- (11) take prompt action to correct any dangerous or hazardous conditions.

**C.** The CM shall not use or store explosives in the performance of the Work unless the CM first obtains the City of Worcester's prior written specific Approval. If the City of Worcester Approves the use or storage of explosives during the performance of the Work, the CM shall first comply with all Laws and obtain all permits, approvals, and certificates required in connection with the same and shall exercise best efforts, including but not limited to the employment and supervision of properly qualified personnel, to prevent damage, injuries, and accidents involving said explosives.

**D.** The CM shall not permit cutting or welding in or immediately adjacent to existing property of the Owner or of anyone else without the City of Worcester's prior Approval in each instance.

**E.** The CM shall submit a safety plan to the City of Worcester and designate by notice to the City of Worcester a full time responsible member of its organization at the Site whose duties shall include preventing accidents.

**F.** The CM shall submit to the City of Worcester without delay verbal and written reports of all accidents involving bodily injury or property damage arising in connection with the Work.

**G.** In any emergency affecting the safety of persons or property the CM shall immediately act in the exercise of reasonable judgment to prevent threatened damage, injury, or loss. The CM shall immediately notify the City of Worcester of such emergency.

**15. Debris and Chemical Waste**

A. The CM shall not permit the accumulation of interior or exterior debris. The CM shall keep the Work area clean at all times. Without limitation, garbage shall be removed daily.

B. The CM shall properly classify and remove debris and waste from the Site and transport and dispose of it, all in accordance with Laws, employing a qualified and properly licensed transporter, at any landfill, disposal or recycling facility licensed under applicable Laws, including without limitation, hazardous materials laws. The CM shall make all arrangements and give and obtain all notices, communications, documentation, permits, certificates, and approvals necessary for said disposal from the owner or officials in charge of such landfills, disposal or recycling facilities. The CM shall bear all fees and costs in connection with such classification, removal, transportation, disposal and storage. The CM shall not permit any storage of debris or waste except in accordance with Laws.

C. The CM shall not permit any open fire on the Site.

D. Chemical Waste: Chemical waste shall be stored in corrosion resistant containers, removed from the Site, and disposed of not less frequently than monthly unless more frequently required by Laws, including without limitation hazardous materials laws, or by the Contract Documents. Disposal of chemical waste shall be performed in accordance with requirements of the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (DEP). Fueling and lubricating of vehicles and equipment shall be conducted in a manner that affords the maximum protection against spills and evaporation. Lubricants shall be disposed of in accordance with procedures meeting all applicable Laws. The CM shall immediately notify the Designer of any hazardous materials release large enough to require reporting under applicable Laws. The CM shall be responsible for immediately cleaning up in accordance with Laws any oil or hazardous materials releases resulting from its operations. Any costs incurred in cleaning up any such releases shall be borne by the CM.

**16. Weather Protection (M.G.L. c. 149, s. 44G and 44F(1))**

The CM shall provide "weather protection," which means temporary protection of that Work adversely affected by moisture, wind and cold. Weather protection shall be achieved by covering, enclosing and/or heating working areas such that a minimum temperature of 40 degrees Fahrenheit is maintained at the working surface during the months of November through March in order to permit construction to be carried on during such period in accordance with the Progress Schedule. After the building or portion thereof is completely enclosed by either permanent construction or substantial temporary materials having a resistance comparable to the specified permanent construction, the CM shall provide heat therein of not less than 55 degrees F. nor more than 75 degrees F. The foregoing provisions do not supersede any specific requirements for methods of construction, curing of materials and the like. Such weather protection shall be consistent with the Progress Schedule, shall permit the continuous progress of the Work necessary to maintain an orderly and efficient sequence of construction operations, shall include one thermometer for every 2,000 square feet of floor space or fraction thereof, shall be subject to the Approval of the City of Worcester, and shall meet such additional requirements as may be specified by the City of Worcester and by the Contract Documents.

**17. Furnishings and Equipment**

When, in the opinion of the Designer, any portion of the Work is in a reasonable condition to receive fittings, furniture, or other property of the Owner not covered by this Contract, the CM shall allow the City of Worcester to bring such fittings, furniture, and/or other property into such portions of the Work and shall provide all reasonable facilities and protection thereof. No such occupancy shall be construed as interfering with the provisions relating to time of completion, or as constituting an acceptance of the whole or any part of the Work. Any furniture or fittings so installed shall be placed in the Work at the risk of the City of Worcester except that the CM shall be liable for damages or losses to such furniture or fittings to the extent such damages or losses arise in whole or in part from the negligence or intentional misconduct of CM, Subcontractors, their agents and/or employees, or anyone for whose acts CM is responsible.

**18. Intentionally Omitted**

**19. Sales Tax Exemption and Other Taxes**

All building materials and supplies as well as the rental charges for construction vehicles, equipment and machinery rented exclusively for use on the Site, or while being used exclusively for the transportation of materials for the Work are entitled to an exemption from sales taxes under M.G.L. c. 64H, s. 6(f). The CM shall take all action required to obtain the benefit of such sales tax exemption. The CM shall bear the cost of any sales taxes that CM incurs in connection with the Work and the City of Worcester shall not reimburse the CM for any such taxes. The exemption number assigned to the CM as an exempt purchaser shall be provided to the CM by the City of Worcester upon the written request of the CM.

**20. Final Cleaning**

At the completion of the Work, the CM shall remove all waste materials, rubbish, tools, equipment, machinery and surplus materials, and professionally clean all sight-exposed surfaces so that the Work is clean and ready for occupancy. Subsequent to installation of User Agency furniture, telephones, and equipment, the CM shall provide such additional cleaning as may be necessary to remove any soil resulting from installation of such furniture, telephones and equipment.

**21. Maintenance Data**

Subject to such additional requirements as may be provided in the Contract Documents, the CM shall compile four complete and identical binders of operating and maintenance data for the entire Work. The CM shall submit record maintenance data to the Designer for approval, shall submit approved maintenance data to the City of Worcester, and shall instruct and train the User Agency's personnel in proper inspection and maintenance procedures.

## **22. Closeout Procedures**

The CM shall take all actions and submit all items required for the issuance of the Certificate of Agency Use and Occupancy and Final Acceptance as specified in the Contract Documents.

## **23. Risk of Loss**

The CM shall bear all risk of loss to the Work during the term of the Contract except for any portion of the Work as to which the Certificate of Agency Use and Occupancy has been issued pursuant to Article VI of these General Conditions of the Contract. Nothing herein shall limit the CM's responsibilities under Article IX or XV of these General Conditions of the Contract.

# **ARTICLE V** **MATERIALS AND EQUIPMENT**

## **1. Materials Generally**

A. Unless otherwise specifically provided in the Contract Documents, the CM shall provide and pay for materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

The CM shall obtain prior written approval from the City of Worcester for permission to store materials or equipment to be incorporated in the Work, for which progress payments will be requested, at off-site locations. Any and all charges for storage, inspection and verification by the Designer and the City of Worcester, including insurance, shall be borne solely by the CM. Before approval, the City of Worcester may require, without limitation (i) evidence that the off-site location is properly secure, (ii) proper proof of insurance and proof of satisfactory contractual arrangements for transportation to the site, and (iii) a certificate from the CM stating:

- (1) The name of the member of the CM or Subcontractor that leases or owns the warehouse or other storage facility;
- (2) The location of such storage facility, including the storage space; i.e., the entire premises or certain areas of a warehouse giving the number of floors or portions thereof, and a certification that the CM has visited such location, verified the storage of such material or equipment therein or thereon (including confirmation that the materials or equipment are marked and segregated as provided below), and verified payment of all current storage charges;
- (3) The date(s) on which the material or equipment is first stored at such facility; and
- (4) A description of the materials or equipment stored, including quantities, types, manufacturers and other identification information, such as serial numbers.

The CM shall furnish to the City of Worcester, not less often than once per month, a current inventory of all materials or equipment being stored at any off-site location.

The CM shall mark each sealed carton or other item with the name of the Project and the City of Worcester, and all materials or equipment stored off-site shall be segregated to the extent required by the City of Worcester or the Designer.

Payment for materials or equipment stored off-site shall be at the reasonable discretion of the City of Worcester, taking into account the schedule requirements of the Work. Title to materials or equipment stored off-site shall be transferred at the time at which the City of Worcester pays for them, free of any lien or other interest of the Supplier or any other lien or encumbrance. Notwithstanding such transfer of title, the CM shall retain sole care, custody and control of, and shall have complete responsibility for the security and protection of, all materials or equipment included in any Application for Payment which are stored at locations other than the site, and the CM assumes all risk of loss or damage to such materials or equipment, and the CM shall hold harmless the City of Worcester from and against all liabilities arising out of or resulting from loss or damage, from any cause, to such materials or equipment for which payment is requested, including liens, security interests or other claims of any kind by Suppliers or other third parties relating to such materials or equipment.

**B.** Materials and equipment to be installed as part of the Work (both or either of which are hereinafter referred to as "materials") shall be new, unused, of recent manufacture, assembled, and used in accordance with the best construction practices. The CM shall inform itself as to, and shall comply with, the provisions of M.G.L. c. 7, s. 23A, as amended, and shall abide by the same and all applicable rules, regulations and orders made thereunder in relation to the purchase of supplies and materials in the execution of the Work, including the provisions of M.G.L. c. 7, s. 22, paragraph 17 which provides that there be *"a preference in the purchase of supplies and materials, other considerations being equal, in favor, first, of supplies and materials manufactured and sold within the Commonwealth, and, second, of supplies and materials manufactured and sold elsewhere within the United States."*

## **2. Shop Drawings, Product Data, and Samples**

**A.** The CM shall furnish to the Designer all samples of the materials to be used in the execution of the Work as required by the Contract Documents. The CM shall furnish to the Designer in a timely manner all coordination Drawings, shop details, Shop Drawings, and setting diagrams which may be necessary for acquiring and installing materials. These shall be reviewed as required by the Designer. A minimum of four (4) copies shall be submitted for final approval, one of which shall be returned to the CM, one to the Resident Engineer, one to the City of Worcester and one filed with the Designer. The inspection and approval by the Designer of Shop Drawings, etc. shall be general and shall in no way relieve the CM from responsibility for proper fitting, coordinating, construction, and construction sequencing. The CM shall furnish to the City of Worcester and the Designer such information and vouchers relative to the Work, the materials therefor, and the persons employed thereon, as the Designer shall from time to time request.

**B.** Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. The purpose of their submission is to demonstrate for those portions of the Work for which submittals are required the way the CM proposes to conform to the information given and the design concept expressed in the Contract Documents.



C. The CM shall review, approve, and submit to the Designer, Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the City of Worcester or of separate contractors. Submittals made by the CM which are not required by the Contract Documents or which do not comply with the Contract Documents may be returned without action. The CM's attention is directed to the provisions of Section 4 of this Article V and to the Specifications.

D. The CM shall prepare and keep current for the Designer's approval a schedule of submittals which is coordinated with the Progress Schedule and allows the Designer reasonable time to review submittals.

E. The CM shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Designer. Such Work shall be in accordance with Approved submittals.

F. By submitting Shop Drawings, Product Data, Samples and similar submittals, the CM represents that the CM has determined and verified materials, field measurements, and field construction criteria related thereto and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

G. The CM shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Designer's approval of Shop Drawings, Product Data, Samples or similar submittals unless the CM has specifically informed the Designer in writing of such deviation at the time of submittal and the City of Worcester has given explicit written approval to the specific deviation. The CM shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals by the Designer's or the City of Worcester's actions.

H. The CM shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Designer on previous submittals.

I. Informational submittals upon which the Designer is not expected to take responsive action may be so identified in the Contract Documents.

J. When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, such certification must be stamped by a registered Massachusetts professional in the discipline required. The Designer shall be entitled to rely upon the accuracy and completeness of such calculations and certifications.

K. Materials furnished or used or employed under the Contract must be equal in quality to the samples furnished and be satisfactory to the Designer.

### **3. Tests**

A. Any material to be used in the Work may be tested or inspected at any time by the Designer with an independent testing company with the prior Approval of the City of Worcester and may be rejected if it fails to comply with specified tests. the City of Worcester shall pay for all testing of specified material. If the CM requests permission to use a material that was not specified, then the CM shall pay for such testing. The cost of testing of any materials that fail the testing criteria shall be borne by the CM

**B.** The CM shall notify the Designer and the City of Worcester of the proposed sources of materials in time to permit all required testing and inspection before the material is needed for incorporation into the Work. The CM shall have no claim arising from CM's failure to designate the proposed source or to order the material in time for adequate testing and inspection. Necessary arrangements shall be made to permit the Designer to make factory, shop or other inspection of materials or equipment ordered for the Work in process of manufacture or fabrication, or in storage elsewhere than the Site.

#### **4. "Or Equal" Submissions**

**A.** Where products or materials are prescribed by manufacturer name, trade name, or catalog reference, the words "or Approved equal" shall be understood to follow. An item shall be considered equal to the item so named or described if in the opinion of the Designer and the City of Worcester (a) it is at least equal in quality, durability, appearance, strength and design, (b) it performs at least equally the function imposed in the general design for the Work, and (c) it conforms substantially, even with deviations, to the detailed requirements for the items as indicated by the Specifications. Any changes in the work made necessary to accommodate products or materials substituted as an "or equal" shall be at the expense of the CM. "Approved equal" shall mean an item with respect to which the City of Worcester shall have issued a written statement to the CM to the effect that the item is, in the City of Worcester's opinion, equal within the meaning of this paragraph to that prescribed in the Contract Documents.

**B.** The CM shall be responsible for providing the Designer with any information and test results that the Designer reasonably requires to determine whether or not a material is equal to a material named or described in the Contract Documents.

**C.** Whenever the CM submits a material for approval as a substitute for a material named or described in the Contract Documents, such submission shall be made at least one hundred twenty (120) days prior to the date the materials will be used in the Work. In no event shall the CM maintain a claim for delays based upon the Designer's review of such substituted materials if the CM has failed to comply with the one hundred twenty (120) day submission requirement.

#### **5. Delivery and Storage of Materials: Inspection**

**A.** Materials and equipment shall be progressively delivered to the Site so that there will be neither delay in the progress of the Work nor an undue accumulation of materials that are not to be used within a reasonable time and so that their security, quality, and fitness of the materials for the Work is preserved.

**B.** Materials stored off Site shall be insured and stored at the expense of the CM so as to guarantee the preservation of their security, quality and fitness for the Work. Without derogating from the CM's responsibilities in the previous sentence, when necessary to avoid deterioration or damage, material (on or off Site) shall be placed on wooden platforms or other hard clean surfaces and not on the ground and shall be properly protected.

**C.** Expenses for inspection of material by the Designer and/or the City of Worcester personnel including travel, quarters, and subsistence shall be borne by the CM requesting the inspection of material stored outside the Commonwealth of Massachusetts as part of the Contract Price. The policy of the City of Worcester precludes the payment

for material stored outside the boundaries of Massachusetts except in extremely limited circumstances with the express written consent of the City of Worcester. If the CM requests an inspection of material stored outside the Commonwealth of Massachusetts, the City of Worcester will initially pay for all expenses of inspecting the material incurred by the Designer and/or the City of Worcester's personnel including travel, quarters, and subsistence. the City of Worcester will then give CM an invoice for those costs and the CM shall submit a credit Change Order for the amount of those expenses.

D. Stored materials either at the Site or at some other location agreed upon in writing shall be so located as to facilitate prompt inspection and even though approved before storage, may again be inspected prior to their use in the Work.

E. All storage sites shall be restored to their original condition by the CM at the CM's expense.

F. The CM shall take charge of and be liable for any loss of or injury to the materials for its use delivered to or in the vicinity of the place where the Work is being done, whether furnished by the Owner or otherwise; the CM shall notify the Designer as soon as any such materials are so delivered, allow them to be examined by the Designer, and furnish workers to assist therewith.

#### **6. Defective, Damaged, or Deteriorated Materials and Rejection Thereof**

The Designer may reject materials if the Designer reasonably determines that such materials do not conform to the Contract Documents in any manner, including but not limited to materials that have become damaged or deteriorated from improper storage whether or not such materials have previously been accepted. The CM at its own expense shall remove rejected materials from the Work. No rejected material, the defects of which have been subsequently corrected, shall be used except with the written permission of the Designer. Should the CM fail to remove rejected material within a reasonable time, the City of Worcester may, in addition to any other available remedies, remove and/or replace the rejected material, and deduct the cost of such removal and/or replacement from any moneys due or to become due the CM. No extra time shall be allowed for completion of Work by reason of such rejection. The inspection of the Work shall not relieve the CM of any of its obligations herein prescribed, and any defective Work shall be corrected. Work not conforming to the Contract Documents may be rejected notwithstanding that such Work and materials have been previously overlooked or misjudged by the Designer and accepted for payment. If the Work or any part thereof shall be found defective at any time before Final Acceptance of the whole Work, the CM shall forthwith make good such defect in a manner satisfactory to the Designer. Nothing in the Contract shall be construed as vesting in the CM any property rights in the materials used after they have been attached or affixed to the Work or the Site; but all such materials shall upon being so attached or affixed become a property of the Owner.

**ARTICLE VI**  
**PROSECUTION AND PROGRESS**

**1. Beginning, Progress Schedule, and Completion of Work**

A. The Contract time shall commence upon the date specified and in accordance with any conditions in the Notice to Proceed.

B. Prior to the submission of the first progress payment, CM shall submit and the City of Worcester shall approve a progress schedule which complies with the requirements of specification section 013200 . Upon Approval by the City of Worcester, said schedule shall constitute the Progress Schedule. The CM shall comply with all requirements of said section 01310.

C. Time is of the essence of this Contract. The Work shall be completed within the time specified in the Owner-CM Agreement. Should the CM require additional time to complete the Work, the CM shall document the reasons therefor and submit a written request for an extension of time within 20 days of the occurrence of the event alleged to be the cause of the delay, as provided in this Article and in Article VII of these General Conditions of the Contract. Failure to submit said written request within the time required by the preceding sentence shall preclude the CM from subsequently claiming any time extension due to said delay.

D. If, in the opinion of the Designer or the City of Worcester, the CM fails to comply with the Progress Schedule, the City of Worcester may give the CM a written notice to that effect. whereupon (1) the CM shall, if the notice requires, discontinue all or any portion of the Work (which discontinuance shall neither terminate the Contract nor give the CM any claim for an increase in the Contract Price, damages, or an extension of any completion deadlines); or (2) at CM's sole cost increase the work force, equipment and plant, or any of them, employed on the whole or any part of the Work, to the extent required by such notice, and employ the same from day to day until the completion of the Work or such part thereof, or until the failure regarding the rate of progress, in the opinion of the Designer or the City of Worcester, shall have been sufficiently corrected.

E. If, in the opinion of the City of Worcester the CM fails to comply with the Progress Schedule, and whether or not the City of Worcester shall have given the CM a notice described in D above, the City of Worcester may (but shall not be required to) give the CM written notice of such failure and five days to cure the same. Unless the CM shall within that five days take all necessary steps to do so (including, if the City of Worcester requires, increasing its forces, equipment and plant) and continue to do so until in the opinion of the City of Worcester the failure is corrected, the City of Worcester may at the CM's expense and without terminating this Contract take exclusive or joint possession of all or a portion of the Site and employ and direct the labors of existing or such additional forces, equipment and plant as may in the Designer's or the City of Worcester's opinion be necessary to insure the completion of the Work or such part thereof within the time specified in the Contract Documents or at the earliest possible date thereafter. the City of Worcester may exercise its rights under this Article at any time and from time to time without waiving any of its rights under this Contract, at law or in equity, including, without limitation, the right to deem this Contract terminated or to order the CM to discontinue the Work at any time thereafter. The CM shall continue to

perform the remaining Work under this Contract even if the City of Worcester elects to have another contractor perform a portion of the Work under this Article.

F. the City of Worcester shall deduct the cost of any actions the City of Worcester takes under this Article from any amount then due or which might have become due to the CM under this Contract had the CM performed as required. On demand, the CM shall pay the City of Worcester any amount by which the cost of completing all or any portion of the Work exceeds the amount attributable to that Work under the Contract Documents. the City of Worcester's sole goal will be to complete the Work that it elects to complete within the time limits stated in the Contract or at the earliest possible date thereafter. Consequently, the City of Worcester shall have no obligation to obtain competitive bids or the lowest cost for completing the Work or any part thereof, except when it is required by law. the City of Worcester's election to complete all or part of the Work shall not release the CM from any liability for failure to complete the Work as the Contract Documents require, and shall not entitle the CM to a claim for an increase in the Contract Price or an extension of the time for completing the Work. If the cost that the City of Worcester incurs in completing all or any portion of the Work is less than the amount that the Contract Documents attribute to that Work, the City of Worcester will pay or credit the difference to the CM, less any other costs and expenses that the City of Worcester incurs, including the cost of supervision, and the Designer's and attorneys' fees and costs.

## **2. Failure to Complete Work on Time - Liquidated Damages**

A. If liquidated damages are specified in the Owner - CM Agreement, the City of Worcester has determined that its damages as a result of CM's failure to complete the Work to the point at which it qualifies for the issuance of a Certificate of Agency Use and Occupancy will be difficult or impracticable to ascertain. Accordingly, if the Work is not completed to such point by the date specified in this Contract, the CM shall pay to the City of Worcester the sum designated as liquidated damages in the Contract for each and every calendar day that the CM is in default in completing the Work to such point. Such moneys shall be paid as liquidated damages, not as a penalty, to cover losses and expenses to the City of Worcester and/or the User Agency resulting solely from the fact that the Work is not completed on time.

B. Similarly, if the Contract states that by a specified date a designated portion of the Work shall be prosecuted to the point at which it qualifies for the issuance of a Certificate of Agency Use and Occupancy, and if such portion has not been prosecuted to such point by said date, the CM shall pay to the City of Worcester the sum designated in the Contract for each calendar day that the CM is in default in completing such portion of the Work to such point. Such moneys shall also be paid as liquidated damages not as a penalty, to cover losses and expenses to the Owner resulting solely from the fact that the Work is not completed on time.

C. the City of Worcester may recover such liquidated damages by deducting the amount thereof from any moneys due or that might become due the CM, and if such moneys shall be insufficient to cover the liquidated damages, then the CM or the Surety shall pay to the City of Worcester the amount due.

**D.** Permitting the CM to continue and finish the Work or any portion of it after the time fixed in the Contract for its completion shall not be deemed as a waiver of any of the Owner's rights hereunder, at law or in equity.

**E.** Liquidated damages or a portion thereof may be waived by the City of Worcester if the CM submits evidence satisfactory to the City of Worcester that the delay was caused solely by conditions beyond the control of the CM and that the City of Worcester has not suffered any damages as a result of said delay.

**F.** Failure by the City of Worcester to specify a sum as liquidated damages in the Owner-CM Agreement, or the insertion of "N/A" or "none" in the space provided therein for liquidated damages, shall not be deemed a waiver of the City of Worcester's right to recover actual damages arising from the CM's failure to complete the Work on time.

### **3. Delays: Statutory Provisions (M.G.L. c. 30, s. 39O)**

**A.** Notwithstanding any provision of this Contract to the contrary, except as otherwise provided by law as set forth in paragraph B below, the CM shall not be entitled to increase the Contract Price or to receive damages on account of any hindrances or delays, avoidable or unavoidable; but if any delay is caused in the opinion of the City of Worcester, by the City of Worcester, the CM shall be entitled to an extension of time. The length of the extension shall be sufficient in the opinion of the City of Worcester for the CM to complete the Work. Although no delay shall increase the Contract Price, the City of Worcester may require that any change in the date by which the CM must complete all or any part of the Work be processed on a standard Change Order form.

**B.** If a suspension, delay, interruption or failure to act of the City of Worcester increases the cost of performance to any Subcontractor, that Subcontractor shall have the same rights against the CM with respect to such increase as the CM shall have against the City of Worcester by virtue of (a) and (b) of M.G.L. c. 30, s. 39O set forth below, but nothing in provisions (a) and (b) shall alter any other rights which the CM or the Subcontractor may have against each other. As used in the statutory language of (a) and (b) below, "contract" means this Contract, "general contractor" means the CM and "Awarding Authority" means the City of Worcester:

*"(a) The Awarding Authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the Awarding Authority; provided, however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the Awarding Authority to act within the time specified in this contract, the Awarding Authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the Awarding Authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.*

*(b) The general contractor must submit the amount of a claim under provision (a) to the Awarding Authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and except for costs due to a suspension order, the Awarding Authority shall not approve any costs in the claim incurred more than*

*twenty days before the general contractor notified the Awarding Authority in writing of the act or failure to act involved in the claim."*

**4. Use and Occupancy Prior to Final Acceptance**

A. The CM agrees to the use and occupancy of the Project or any portion thereof before Final Acceptance of the Work by the City of Worcester.

B. the City of Worcester and the User Agency will cooperate with the CM with respect to the completion of the Work by taking such reasonable steps as may be possible to avoid interference with the CM's Work provided that they do not interfere with the proper functioning of the facility.

C. The CM shall not be responsible for wear and tear or damage resulting solely from temporary occupancy.

D. Use and occupancy of any part of the Work prior to Final Acceptance by the City of Worcester shall not relieve the CM from maintaining the required payment and performance bonds and insurance (to the extent that insurance is required to be maintained after Substantial Completion) required by this Contract.

**5. Certificate of Agency Use and Occupancy**

A. When the Work, or portion thereof which the City of Worcester agrees to accept separately has reached the state of Substantial Completion as shown on an Approved payment request, the CM shall develop, with the participation of the Designer and the City of Worcester, the Punch List identifying those items of unfinished or unacceptable Work that remain to be performed or corrected under the Contract.

B. Before the Work shall be deemed completed to the point where it is ready for the issuance of a Certificate of Agency Use and Occupancy, the CM shall:

- (1) Provide CM's proposed Punch List containing a statement of the reason for each item listed thereon;
- (2) Advise the City of Worcester of proposed changes in insurance in accordance with the provisions of this Contract, and provide to the City of Worcester evidence of CM's Completed Operations insurance coverage to the extent required by the Contract Documents;
- (3) Execute and submit a notarized warranty on a form provided by the City of Worcester meeting the requirements of Article IX of these General Conditions of the Contract, to commence upon the date of the issuance of the Certificate of Agency Use and Occupancy for the Work or the designated portion thereof, unless otherwise provided in the Certificate of Agency Use and Occupancy;
- (4) Submit signed special warranties and warranties of longer than one year as required by the Contract Documents;
- (5) Submit signed maintenance agreements for all portions of the Work specified to receive maintenance after the issuance of the Certificate of Agency Use and Occupancy;
- (6) Submit all preliminary record Drawings and documents and framed data in the forms required by the Contract Documents;
- (7) Complete all items required to be completed by the Department of Public Safety and obtain a Certificate of Occupancy from the Department of

- Public Safety and similar releases which permit the User Agency and the City of Worcester full and unrestricted use of the areas claimed to be ready for occupancy;
- (8) Deliver specified maintenance stocks of materials, required spare parts, and all special tools furnished by manufacturers to persons designated by the City of Worcester and obtain written receipts for same;
  - (9) Make final changes of lock cylinders or cores and advise the City of Worcester of the change of project security responsibility;
  - (10) Complete start-up of systems and instruct User Agency personnel on proper operation and routine maintenance of all systems and equipment; obtain and submit to Agency personnel that start-up and instruction have been completed;
  - (11) Remove all remaining temporary facilities that are no longer needed, surplus materials, and debris; (the CM shall not remove construction offices and trailers without the prior Approval of the City of Worcester);
  - (12) Submit final utility meter readings and similar information and advise the User Agency and the City of Worcester of the change of responsibility for utility charges and payments upon the issuance of the Certificate of Agency Use and Occupancy;
  - (13) Complete final clean-up of all Work, restoration of damaged finishes, and replacement of all damaged and broken glass not listed on the CM's Punch List.
  - (14) Complete such other items as may be called for in the Contract Documents, if any, or in the Specifications.

C. After completing the items specified in subsection B above, the CM shall make a written request for the Designer's inspection for a Certificate of Agency Use and Occupancy in accordance with the Contract Documents. The Designer shall review the submittals and the Work and shall either 1) sign a Certificate of Agency Use and Occupancy or 2) notify the CM of incomplete and/or incorrect Work that must be completed and corrected prior to the issuance of the Certificate of Agency Use and Occupancy. The Designer shall notify the CM of any additions to the Punch List. In connection with the execution of the Certificate of Agency Use and Occupancy the Designer shall assign dollar values to each item on the Punch List. Failure to include any incomplete or defective item on the Punch List shall not relieve the CM of the obligation to complete all Work in accordance with the Contract Documents.

## **6. Final Acceptance of the Work**

A. Prerequisites for Final Acceptance. After the issuance of a Certificate of Agency Use and Occupancy for the entire Work, and after the CM has completed all of the Work required by this Contract, including Change Orders and Punch List Items, the CM shall submit the following completed items to the City of Worcester together with such additional items as may be specified in the Contract Documents:

- (1) A completed Final Application for Payment showing a final accounting of all changes in the Work, on the form provided by the City of Worcester.
- (2) Certification and satisfactory evidence that all taxes, fees, and similar obligations have been paid.



- (3) Consent of the Surety to Final Payment executed by applicable bonding companies.
- (4) Certified copy of the Punch List stating that the CM has completed or corrected every item listed.
- (5) Evidence of CM's continuing Completed Operations Insurance coverage to the extent required by the Contract Documents.
- (6) All final record Drawings and documents in the forms specified by the Contract Documents.
- (7) A notarized certification that all purchases made under the tax exemption certificate were legitimate and entitled to exemption.
- (8) Written certifications from the Department of Public Safety and the Designer to the effect that: a) the Work has been inspected for compliance with the Contract Documents and has satisfied the Department of Public Safety; b) all equipment and systems included in the Work have been tested in the presence of the Designer and are operational and satisfactory; c) the Work is completed and ready for final inspection.
- (9) Such other items as may be required by the Contract Documents.

**B. Re-inspection; Final Acceptance.** After notification from the CM that all remaining contract exceptions, omissions and incompletions have been completed (with the exception of CM's continuing warranty, insurance, indemnification, and such other obligations as are intended by the terms of the Contract Documents to extend beyond the date of Final Acceptance), the City of Worcester and the Designer shall inspect the Work to verify the completion of the same. If the Work is satisfactory, the City of Worcester shall prepare a Certificate of Final Acceptance or shall notify CM of items which remain to be completed prior to Final Acceptance.

#### **7. One-Year Warranty Repair List and Inspection**

Approximately 30 days prior to the expiration of the comprehensive one-year warranty period, the CM shall schedule an appointment with the City of Worcester for a re-inspection of the Work with the City of Worcester, and shall thereafter inspect the work at the time scheduled. Based on this inspection and on prior inspections, the City of Worcester shall issue a "Warranty Repair List" of items to be corrected by the CM. The CM shall make the repairs and/or replacements listed within 30 days of the issuance of the Warranty Repair List unless otherwise agreed by the City of Worcester in writing.

## **ARTICLE VII** **CHANGES IN THE WORK**

### **1. Change Orders Generally**

**A.** No changes in the Work, the Contract Price, the Substantial and Final Completion dates, or any other provision of an Approval by the City of Worcester of the Contract Documents shall be made in absence of a Change Order as defined in Article I of these General Conditions of the Contract, directing the CM to perform such changes. Any request for a change in the provisions of this Contract submitted by the CM must be made in writing and in accordance with the provisions of this Contract, including the procedures of the City of Worcester.

**B.** A request for a change in the provisions of this Contract may be submitted to the City of Worcester by the CM, Designer, Resident Engineer or User Agency. The request must be made in writing and in accordance with the provisions of this Contract, Laws, and the procedures of the City of Worcester. When the CM believes that an event or circumstance gives rise to an adjustment in the Contract Price and/or the Contract Time it shall submit a request for a change order in accordance with the forms and procedures required by the City of Worcester.

**C.** A written directive (sometimes called a Notice to Proceed or a Notice of Intent may be issued by the City of Worcester instructing the CM to make changes in the Work within the scope of the Contract, including but not limited to, changes in: (1) the Plans and Specifications; (2) the method or manner of performance of the Work; (3) the Owner-furnished facilities, equipment, materials, services or Site; (4) the schedule for performance of the Work.

**D.** The CM shall immediately perform any changes in the work that are ordered by the City of Worcester.

**E.** Whenever a Change Order or written directive will cause a change in the CM's cost, the CM or the City of Worcester may request an adjustment in the Contract Price. Such request shall be in writing and shall be submitted by the party making such claim to the other party before commencement of the pertinent work or as soon thereafter as possible.

**F.** the City of Worcester and the CM shall negotiate in good faith an agreement on an equitable adjustment in the Contract Price, and/or time if appropriate, before commencement of the pertinent work or as soon thereafter as is possible. In the absence of an agreement for an equitable adjustment, the City of Worcester shall unilaterally determine the costs attributable to the change and provide the CM with a written notice to that effect. The CM may appeal the decision of the City of Worcester within thirty days of receipt of said notice, to the commissioner of the City of Worcester or his designee, and the CM shall have the right to such further appeal as is provided in M.G.L. c.30, s. 39Q set forth in Section 4.D of this Article VII. However, if the CM shall exercise its rights to appeal the decision of the City of Worcester as aforesaid, the CM shall be required to engage in the mandatory mediation procedures set forth in Section 5 of this Article VII.

**G.** During the negotiation of an equitable adjustment in the Contract Price, the CM shall, if requested, provide the City of Worcester with all cost, pricing data and any other information or documentation used by it in computing the amount of the equitable

adjustment, and the CM shall certify that the pricing data used was accurate, complete, current and reasonable. If the City of Worcester subsequently determines that the data submitted by the CM was incomplete, incorrect, not current, or unreasonable, the City of Worcester may exclude such data from consideration under the equitable adjustment request.

**H.** Whenever the Construction Manager is entitled or believes it is entitled to a Change Order adjusting the Contract Price, the Construction Manager shall maintain separate accounts (by job order or other suitable accounting procedure) of all costs incurred and attributable to such work. The Construction Manager shall maintain a computerized accounting system, acceptable to the City of Worcester, in which current information as to the status of all such work is maintained. The Construction Manager shall maintain such contemporaneous records as are necessary to provide a clear distinction between the costs of all Change Order Work and proposed Change Order Work, and the costs of other Work.

**I.** Notwithstanding any provisions in the Contract Documents to the contrary, no additional General Conditions Cost shall be due for any Change Order or portion of a Change Order resulting from or attributable to:

- (1) Increases in the cost of Allowance items;
- (2) Substitutions of equipment or materials which are functionally similar to equipment or materials specified in the Contract Documents; or
- (3) Sales and use taxes.

## **2. Methods of Computing Equitable Adjustments**

**A.** Equitable adjustments in the Contract Price shall be determined according to one of the following methods, or a combination thereof, as determined by the City of Worcester:

- (1) fixed price basis, provided that the fixed price shall be inclusive of items (a) through (e) below and shall be computed in accordance with those provisions;
- (2) estimated lump sum basis to be adjusted in accordance with Contract unit prices or other agreed upon unit prices provided that the unit prices shall be inclusive of all costs related to such equitable adjustment;
- (3) time and materials basis to be subsequently adjusted on the basis of actual costs (but subject to a predetermined "not to exceed limit") calculated as follows:
  - a) the direct cost (or credit) for labor at the minimum wage rates established for this Contract pursuant to M.G.L. c. 149, s 26-27H, and the direct cost for material and use of equipment;
  - b) plus (or minus) the cost of Workmen's Compensation Insurance, Liability Insurance, Federal Social Security and Massachusetts Unemployment Compensation, or as an alternative the CM may elect to use a flat 30% of the total labor rate computed in accordance with subparagraph (a) above;
  - c) plus an allowance equal to 20% of the amount of (a) above for General Conditions, overhead, superintendence, fee, and profit; (5% of the allowance shall be paid to the CM and the Subcontractor shall be paid 15% of the Allowance).

- d) plus (or minus) the actual direct additional premium costs and expenses incurred as a result of collective bargaining agreements or other agreements between organized labor and employers, and plus (or minus) the actual direct premium cost of payment and performance bonds required of CM and Trade Subcontractors for this Contract.

**B.** If the net change is an addition to the Contract Price, it shall include the CM's overhead, superintendence and profit. On any change that involves a net credit, no allowance for overhead, superintendence and profits shall be included. For any change that does not include labor performed or materials installed in the project, there will be no markup for the CM's or Subcontractor's overhead, superintendence, and profit, even though there may be a net increase in the Contract Price. Charges for small tools known as "tools of the trade" are not to be computed in the amount of any change in the Contract Price.

**C.** Adjustments in Subcontractors made under the provisions of the Procedure for Award of Subcontracts shall not be considered Change Orders and shall not entitle the CM to any adjustments for overhead, profit, and superintendence, although the City of Worcester may require that such Contract adjustments be processed on standard Change Order and equitable adjustment forms.

### **3. Work Performed under Protest**

The CM agrees to perform all Work as directed by the City of Worcester, and if the the City of Worcester determines that certain Work that the CM believes to be or to warrant a Change Order under this Article does not represent a change in the Work, the CM shall perform said Work. The CM shall be deemed to have concurred with the the City of Worcester's determination as aforesaid unless the CM shall perform Work under protest in compliance with the following sub-paragraphs (1) and (2) below:

- (1) If the CM claims compensation for a change in the Work that is not deemed by the the City of Worcester to be a change or to warrant additional compensation as claimed by the CM, the CM shall on or before the first working day following the commencement of any such work or the sustaining of any such damage submit to the City of Worcester a written statement of the nature of such work or claim. The CM shall not be entitled to additional compensation for any work performed or damage sustained for which written notice is not given within the time limit specified in the preceding sentence, even though similar in character to work or damage with respect to which notice is timely given.
- (2) On or before the second working day after the commencement of such work or the sustaining of such damage, and daily thereafter, the CM shall file to the extent possible with the Resident Engineer, the Designer, and the City of Worcester, itemized statements of the details and costs of such work performed or damage sustained. The CM shall use the City of Worcester Daily Time and Materials Report found in the City of Worcester Form 13 to record all labor and material used. If the CM shall fail to make such statements to the extent possible, then the CM shall not be entitled to additional compensation for any such work or damages.

**4. False Claims, Statutory Provisions Regarding Changes**

**A. Criminal Penalties:** The CM's attention is directed to M.G.L. c. 30, s. 39I which provides criminal penalties for unauthorized deviations from the Plans and Specifications, and to M.G.L. c. 30, s. 39J and M.G.L. c. 7, s. 42E-42I. The CM's attention is also directed to M.G.L. 266, s. 67B which provides criminal penalties for false claims by Contractor under this Contract:

*"Whoever makes or presents to any employee, department, agency or public instrumentality of the commonwealth, or of any political subdivision thereof, any claim upon or against any department, agency, or public instrumentality of the commonwealth, or any political subdivision thereof, knowing such claim to be false, fictitious, or fraudulent, shall be punished by a fine of not more than ten thousand dollars or by imprisonment in the state prison for not more than five years, or in the house of correction for not more than two and one-half years, or both."*

**B. Differing Site Conditions (M.G.L. c. 30, s. 39N):**

*"If, during the progress of the work, the contractor or the Awarding Authority discovers that the actual subsurface or latent physical conditions encountered at the Site differ substantially or materially from those shown on the plans or indicated in the contract documents either the contractor or the contracting authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing Site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a contractor, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly."*

**C. Timely Decision By the City of Worcester( M.G.L. c. 30, s. 39P):** *"Every contract subject to section thirty-nine M of this chapter or section forty-four A of chapter one hundred forty-nine which requires the Awarding Authority, any official, its architect or engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision be made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires extended investigation and study, the Awarding Authority, the official, architect or engineer shall, within thirty days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty day period and the date by which the decision will be made."*

**D. Change Order / Contract Interpretation Appeal Procedure (M.G.L. c. 30, s. 39Q):** The following provisions apply to every contract awarded by any state agency as defined by M.G.L. c. 7, s. 39A for the construction, reconstruction, alteration,

remodeling, repair or demolition of any capital facility as defined by the aforesaid section 39A:

*"(a) Disputes regarding changes in and interpretations of the terms or scope of the contract and denials of or failures to act upon claims for payment for extra work or materials shall be resolved according to the following procedures, which shall constitute the exclusive method for resolving such disputes. Written notice of the matter in dispute shall be submitted promptly by the claimant to the chief executive official of the state agency which awarded the contract or his designee. No person or business entity having a contract with a state agency shall delay, suspend, or curtail performance under that contract as a result of any dispute subject to this section. Any disputed order, decision or action by the agency or its authorized representative shall be fully performed or complied with pending resolution of the dispute.*

*"(b) Within thirty days of submission of the dispute to the chief executive official of the state agency or his designee, he shall issue a written decision stating the reasons therefore, and shall notify the parties of their right of appeal under this section. If the official or his designee is unable to issue a decision within thirty days, he shall notify the parties to the dispute in writing of the reasons why a decision cannot be issued within thirty days and of the date by which the decision shall issue. Failure to issue a decision within the thirty-day period or within the additional time period specified in such written notice shall be deemed to constitute a denial of the claim and shall authorize resort to the appeal procedure described below. The decision of the chief executive official or his/her designee shall be final and conclusive unless an appeal is taken as provided below.*

*"(c) Within twenty-one calendar days of the receipt of a written decision or of the failure to issue a decision as stated in the preceding subparagraph, any aggrieved party may file a notice of claim for an adjudicatory hearing with the division of hearing officers or the aggrieved party may file an action directly in a court of competent jurisdiction and shall serve copies thereof upon all other parties in the form and manner prescribed by the rules governing the conduct of adjudicatory proceedings of the division of hearing officers. In the event an aggrieved party exercises his option to file an action directly in court as provided in the previous sentence, the twenty-one day period shall not apply to such filing and the period of filing such action shall be the same period otherwise applicable for filing a civil action in superior court. The appeal shall be referred to a hearing officer experienced in construction law and shall be prosecuted in accordance with the formal rules of procedure for the conduct of adjudicatory hearings of the division of hearing officers, except as provided below. The hearing officer shall issue a final decision as expeditiously as possible, but in no event more than one hundred and twenty calendar days after conclusion of the adjudicatory hearing, unless the decision is delayed by a request for extension of time for filing post-hearing briefs or other submissions assented to by all parties. Whenever, because an extension of time has been granted, the hearing officer is unable to issue a decision within one hundred and twenty days, s/he shall notify all parties of the reasons for the delay and the date when the decision will issue.*

*Failure to issue a decision within the one hundred and twenty-day period or within the additional period specified in such written notice shall give the petitioner the right to pursue any legal remedies available to him without further delay.*

*"(d) When the amount in dispute is less than ten thousand dollars, a contractor who is party to the dispute may elect to submit the appeal to a hearing officer experienced in construction law for expedited hearing in accordance with the informal rules of practice and procedure of the division of hearing officers. An expedited hearing under this subparagraph shall be available at the sole option of the contractor. The hearing officer shall issue a decision no later than sixty days following the conclusion of any hearing conducted pursuant to this subparagraph. The hearing officer's decision shall be final and conclusive, and shall not be set aside except in cases of fraud."*

#### **5. Mandatory Mediation**

In the case of every dispute where the dollar amount in dispute (or the estimated dollar value of the extension of time in dispute) is \$50,000 or more and the CM appeals the decision of the chief executive officer of the City of Worcester or his designee described in Section 4.B above, the City of Worcester and the CM shall engage in good faith in a non-binding mediation process, which process shall be concluded within sixty days from the date that the CM files an appeal from said decision as provided in Section 4.B above. In the case of such disputes where the dollar amount in dispute (or the estimated dollar value of the extension of time in dispute) is \$500,000 or more, the parties shall, if the mediation process fails, submit the dispute to a third-party Neutral or Dispute Review Board which shall within sixty days render a non-binding advisory opinion. Unless the parties have previously agreed in writing to a process for submitting disputes to mediation or a Dispute Review Board, the City of Worcester shall determine in its reasonable discretion the procedures to be followed and shall give the CM notice of the same in writing within 7 days of the date that the City of Worcester receives notice of the CM's appeal from the decision of the chief executive officer of the City of Worcester or his designee. The cost of the services of any mediator selected by one party to this Contract shall be borne by the party making the selection. The cost of the services of any mediator selected jointly by the parties to this Contract or jointly by mediators selected by the parties to this Contract shall be borne equally by the CM and the City of Worcester.

### **ARTICLE VIII** **PAYMENT PROVISIONS**

#### **1. Schedule of Values**

Before submission of the first request for payment under this Contract, the CM shall submit to the City of Worcester a schedule of values for its approval, which shall include all preconstruction activities as well as all construction activities and shall be in sufficient detail to reflect the various preconstruction activities and the major components of each construction trade (with relevant Subcontractors as well as MBE/WBEs noted), including quantities when requested, aggregating the GMP with detail for the Contingency and divided so as to facilitate payments for work under each section of the Specifications. The

schedule shall be prepared in such form and supported by such data to substantiate its accuracy as the the City of Worcester may require. When Approved by the the City of Worcester, it shall constitute the Schedule of Values and shall be used only as a basis for the CM's requests for payments and credits, the first of which payments shall not be made until such Schedule of Values is approved by the City of Worcester.

## **2. Payment Liabilities of CM**

**A.** The CM shall pay to the City of Worcester all expenses, losses and damages, as determined by the City of Worcester , incurred in consequence of any default, defect, omission or mistake of the CM or his employees or Subcontractors or the making good thereof.

**B.** If the Work (or a portion thereof) is not completed to Substantial Completion and the CM has not satisfied the requirements for the issuance of a Certificate of Agency Use and Occupancy in accordance with Article VI, Section 5 of these General Conditions, by the date specified in the Owner-CM Agreement, the CM shall pay to the Owner liquidated damages as provided in Article VI, Section 2 of these General Conditions of the Contract.

## **3. Retention of Moneys by the City of Worcester**

**A.** the City of Worcester may keep any moneys which would otherwise be payable at any time hereunder, and apply the same, or so much as may be necessary therefor, to (1) the the City of Worcester 's expenditures for the CM's account, (2) to secure the City of Worcester's remedies against the CM for the CM's breach of its obligations under this Contract or the breach of any person performing any part of the Work and (3) the payment of any expenses, losses or damages incurred by the City of Worcester or any agency of the Commonwealth as a result of the failure of the CM to perform its obligations hereunder. the City of Worcester may retain, until all claims are settled, such moneys as the City of Worcester estimates to be the fair value of the City of Worcester's claims against the CM, and of all claims for labor performed or furnished and for materials used or employed in or in connection with the Work and for the rental of vehicles, appliances and equipment employed and for the employment of substitute contractors and labor in connection with the Work filed in accordance with M.G.L. c. 30, s. 39A and s. 39F. the City of Worcester may make such settlements and apply thereto any moneys retained under this Contract.

**B.** The CM shall each week examine all claims so filed, and if the same are in any respect incorrect or do not correctly show the amount due from the CM to the claimant for such labor and materials, the CM shall forthwith file with the City of Worcester a separate written statement of all inaccuracies in each claim and of the correct amount due from the CM to each claimant therefor, and shall immediately file a statement of all payments thereafter made to such claimants. Each such statement shall be sworn to and contain a detailed breakdown required by M.G.L. c. 30 s. 39F(d) and (e). Unless such statements are so filed by the CM the amount shown by the claims filed shall at the option of the City of Worcester be conclusively deemed to be the accurate amount due from the CM therefor in all accounting with the City of Worcester. If the moneys retained under this Contract are insufficient to pay the sums found by the City of Worcester to be due under the claims for labor and materials filed as aforesaid, the City



of Worcester may, at its discretion, pay the same, and the CM shall repay to the City of Worcester all sums paid out. the City of Worcester may also at its discretion use any moneys retained, due or to become due under this Contract, for the purpose of paying for both labor and materials used or employed in the Work for which claims have not been filed with the City of Worcester.

C. No moneys retained under the provisions of this Article shall be held to be statutory security for the payment of claims filed in accordance with the provisions of M.G.L. c. 149, s. 29, as amended, for which security is provided by bond.

#### **4. Applications for Payment**

A. The CM shall, once in each month on the day of the month corresponding to the day of the month specified in the Notice to Proceed referenced in Article 2 of the Owner - CM Agreement, on forms provided and in the manner prescribed by the Awarding Authority, submit to the Awarding Authority a statement showing the total amount of Work done to the time of such estimate and the value thereof as approved by the Resident Engineer and the Designer. It shall be the sole responsibility of the CM to deliver or cause to be delivered to the Resident Engineer (the "designee" as provided by M.G.L. c. 30, s. 39K), said periodic estimate in proper form, approved as provided above and arithmetically correct. All periodic estimates shall contain such certifications and other evidence supporting the CM's right to payment as the Awarding Authority may require, including without limitation, lien waivers and other evidence, on such forms as the Awarding Authority may require, establishing that title to the equipment or materials is unencumbered and has been transferred to the Owner. If there is no Resident Engineer assigned to the Contract, the Designer shall be the designee. If there is neither a Resident Engineer nor a Designer the designee shall be a person designated by the Awarding Authority at the project field office or alternatively the home office of the Awarding Authority. The CM shall include in such periodic estimate only such materials as are incorporated in the Work, except as provided in paragraph C below. The Awarding Authority shall retain five percent of such estimated value as part security for the completion of the Work and shall pay to the CM while carrying on the Work the balance not retained as aforesaid, subject to the Approval of the Awarding Authority after deducting therefrom all previous payments and all sums to be kept under the provisions of this Contract.

B. Each periodic estimate shall constitute the CM's representation that (1) the payment then requested to be disbursed has been incurred by the CM on account of the Work and is justly due to Subcontractors or, to the CM in the case of other Work performed by the CM on account thereof, (2) the materials, supplies and equipment for which Application for Payment is being submitted have been installed or incorporated into the Work or have been stored at the Site or at such off Site storage locations as the Awarding Authority shall have Approved, (3) the materials, supplies and equipment are insured in accordance with the provisions of this Contract, (4) the materials, supplies and equipment are owned by the Owner and are not subject to any liens or encumbrances, (5) the Work which is the subject of such periodic estimate has been performed in accordance with the Contract Documents and (6) that all due and payable bills with respect to the Work have been paid to date or shall be paid from the proceeds of such periodic estimate. The CM's attention is directed to the criminal penalties for false claims referenced in paragraph A above.

C. The CM may include in a periodic estimate the value of materials or equipment delivered at the Site (or at some location agreed to in writing) only upon delivery to the Awarding Authority of: (1) an acceptable transfer of title on the form provided by the Awarding Authority; (2) written certification by the CM (or applicable subcontractor) on the form provided by the Awarding Authority that the CM (or the Subcontractor which executed the transfer of title) is the lawful owner and that the materials or equipment are free from all encumbrances, accompanied by receipted invoices or other acceptable proof of prior payment for such materials; (3) a stored materials insurance binder that covers the materials for which payment is requested, that names the Owner as an insured party should the stored materials be subjected to any casualty, loss, or theft prior to their inclusion in the Work. The material(s) or equipment must, in the judgment of the Designer (1) meet the requirements of the Contract, including prior shop drawing, product data, and sample approval, (2) be ready for use, and (3) be properly stored by the CM and be adequately protected until incorporated into the Work. See also Article V.5.C of these General Conditions of the Contract concerning the cost of inspections.

D. The Awarding Authority may make changes in any periodic estimate submitted by the CM in accordance with M.G.L. c.30, s. 39K (see below) and the payment due shall be computed in accordance with the changes so made. The provisions of said section 39K shall govern payments on which the Awarding Authority has made changes.

E. No certificate for payment and no progress payment shall constitute acceptance of Work that is not in accordance with the Contract Documents.

F. The CM and all Subcontractors furnishing labor on this Contract agree to furnish certified payroll reports if requested to do so, at no additional expense to the Awarding Authority. The Awarding Authority may at all reasonable times audit such reports.

##### **5. Periodic Payments ( M.G.L. c. 30, s. 39K)**

The Awarding Authority shall make payment to the CM in accordance with M.G.L. c. 30, s. 39K, which provides as follows:

*"Within fifteen days (30 days in the case of the commonwealth, including local housing authorities) after receipt from the contractor, at the place designated by the awarding authority if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the awarding authority will make a periodic payment to the contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed upon in writing) to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances, but less (1) a retention based on its estimate of the fair value of its claims against the contractor and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and less (3) a retention not exceeding five percent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five days after (a) the contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the awarding authority, less than one percent of the original contract price, or (b) the contractor substantially completes the work and*

*the awarding authority takes possession for occupancy, whichever occurs first, the awarding authority shall pay the contractor the entire balance due on the Contract less (1) a retention based on its estimate of the fair value of its claims against the contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, or based on the record of payments by the contractor to the subcontractors under this contract if such record of payment indicates that the contractor has not paid subcontractors as provided in section thirty-nine F. If the awarding authority fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen days (twenty-four days in the case of the commonwealth) after receipt of such periodic estimate from the contractor, at the place designated by the awarding authority if such a place is so designated. The contractor agrees to pay to each subcontractor a portion of any such interest paid in accordance with the amount due each subcontractor.*

*The awarding authority may make changes in any periodic estimate submitted by the contractor and the payment due on said periodic estimate shall be computed in accordance with the change so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided, that the awarding authority may, within seven days after receipt, return to the contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such periodic estimate shall be the date of receipt of the corrected periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter. The provisions of section thirty-nine G shall not apply to any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building to which this section applies.*

*All periodic estimates shall be submitted to the awarding authority, or to its designee as set forth in writing to the contractor, and the date of receipt by the awarding authority or its designee shall be marked on the estimate. All periodic estimates shall contain a separate item for each filed subtrade and each sub-subtrade listed in sub-bid form as required by specifications and column listing the amount paid to each filed subcontractor as of the date of the periodic estimate is filed. The person making payment for the awarding authority shall add the daily interest provided for herein to each payment for each day beyond the due date of receipt marked on the estimate.*

*A certificate of the architect to the effect that the contractor has fully or substantially completed the work shall, subject to the provisions of section thirty-nine J, be conclusive for the purposes of this section.*

*Notwithstanding the provisions of this section, at any time after the value of the work remaining to be done is, in the estimation of the awarding authority, less than 1 per cent of the adjusted contract price, or the awarding authority has determined that the contractor has substantially completed the work and the awarding authority has taken possession for occupancy, the awarding authority may send to the general contractor by certified mail, return receipt requested, a complete and final list of all incomplete and unsatisfactory work items, including, for each item on the list, a good faith estimate of the fair and reasonable cost of completing such item. The general contractor shall then complete all such work items within 30 days of receipt of such list or before the contract completion date, whichever is later. If the general contractor fails to complete all incomplete and unsatisfactory work items within 45 days after receipt of such items furnished by the awarding authority or before the contract completion date, whichever is later, subsequent to an additional 14 days' written notice to the general contractor by certified mail, return receipt requested, the awarding authority may terminate the contract and complete the incomplete and unsatisfactory work items and charge the cost of same to the general contractor and such termination shall be without prejudice to any other rights or remedies the awarding authority may have under the contract. The awarding authority shall note any such termination in the evaluation form to be filed by the awarding authority pursuant to the provisions of section 44D of chapter 149."*

**6. Payment of Subcontractors (M.G.L. c. 30, s. 39F)**

The CM shall make payments to Subcontractors in accordance with M.G.L c.30, s. 39F which is quoted in this section below. For the purposes of this Contract, the word "forthwith" appearing in paragraph (1)(a) of the quoted provision shall be deemed to mean "within five (5) business days."

*"I (a) Forthwith after the general contractor receives payment on account of a periodic estimate, the general Contractor shall pay to each subcontractor the amount paid for the labor performed and the materials furnished by that subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.*

*(b) Not later than the sixty-fifth day after each subcontractor substantially completes his work in accordance with the Plans and Specifications, the entire balance due under the subcontract less amounts retained by the City of Worcester as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the subcontractor; and the Awarding Authority shall pay that amount to the general contractor. The general contractor shall forthwith pay to the subcontractor the full amount received from the Awarding Authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.*

*(c) Each payment made by the Awarding Authority to the general contractor pursuant to subparagraphs (a) and (b) of this paragraph for the labor performed*

*and the materials furnished by a subcontractor shall be made to the general contractor for the account of that subcontractor; and the Awarding Authority shall take reasonable steps to compel the general contractor to make each such payment to each such subcontractor. If the Awarding Authority has received a demand for direct payment from a subcontractor for any amount which has already been included in a payment to the general contractor or which is to be included in a payment to the general contractor for payment to the subcontractor as provided in subparagraphs (1) and (2) the Awarding Authority shall act upon the demand as provided in this section.*

*(d) If, within seventy days after the subcontractor has substantially completed the subcontract work, the subcontractor has not received from the general contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount retained by the Awarding Authority as the estimated cost of completing the incomplete and unsatisfactory items of work, the subcontractor may demand direct payment of that balance from the Awarding Authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the Awarding Authority, and a copy shall be delivered to or sent by certified mail to the general contractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the subcontractor has substantially completed the subcontract work. Within ten days after the subcontractor has delivered or so mailed the demand to the Awarding Authority and delivered or so mailed a copy to the general contractor, the general contractor may reply to the demand. The reply shall be by a sworn statement to or sent by certified mail to the Awarding Authority and a copy shall be delivered to or sent by certified mail to the subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor and of the amount due for each claim made by the general contractor against the subcontractor.*

*(e) Within fifteen days after receipt of the demand by the Awarding Authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the Awarding Authority shall make direct payment to the subcontractor of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount (i) retained by the Awarding Authority as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the general contractor in the sworn reply; provided that the Awarding Authority shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by subparagraph (d). The Awarding Authority shall make further direct payments to the subcontractor forthwith after the removal of the basis for deduction from direct payments made as provided in parts (i) and (ii) of this subparagraph.*

- (f) The Awarding Authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of subparagraph (5) in an interest-bearing joint account in the names of the general contractor and the subcontractor in a bank in Massachusetts selected by the Awarding Authority or agreed upon by the general contractor and the subcontractor and shall notify the general contractor and the subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the general contractor and the subcontractor or as determined by decree of a court of competent jurisdiction.*
- (g) All direct payments and all deductions from demands for direct payments deposited in an interest bearing account or accounts in a bank pursuant to subparagraph (6) shall be made out of amounts payable to the general contractor at the time of receipt of a demand for direct payment from a subcontractor and out of amounts which later become payable to the General contractor and in the order of receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the Awarding Authority to the general contractor to the extent of such payment.*
- (h) The Awarding Authority shall deduct from payments to a General contractor amounts which, together with the deposits in interest bearing accounts pursuant to subparagraph (6) are sufficient to satisfy all unpaid balances of demands for direct payment received from subcontractors. All such amounts shall be earmarked for such direct payments, and the subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the general contractor.*
- (i) If the subcontractor does not receive payment as provided in subparagraph (1) or if the general contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the subcontractor and the subcontractor does not receive payment for same when due less the deductions provided for in subparagraph (1), the subcontractor may demand direct payment by following the procedure in subparagraph (4) and the general contractor may file a sworn reply as provided in that same subparagraph. A demand made after the first day of the month following that for which the subcontractor performed or furnished the labor and materials for which the subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the general contractor. Thereafter the Awarding Authority shall proceed as provided in subparagraph (e), (f), (g) and (h)."*
- (2) Any assignment by a subcontractor of the rights under this section to a surety company furnishing a bond under the provisions of section twenty-nine of chapter one hundred forty-nine shall be invalid. The assignment and subrogation rights of the surety to amounts included in a demand for direct payment which are in the possession of the Awarding Authority or which are on deposit pursuant to subparagraph (6) shall be subordinate to the rights of all subcontractors who are entitled to be paid under this section and who have not been paid in full.*
- (3) "subcontractor" as used in this section (I) for contracts awarded as provided in sections forty-four A to forty-four L, inclusive, of chapter one hundred forty-nine shall mean a person who files a sub-bid and received a subcontract as a result of that filed*

*sub-bid or who is approved by the Awarding Authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, (ii) for contracts awarded as provided in paragraph (1) of section thirty-nine M of chapter thirty shall mean a person approved by the Awarding Authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, and (iii) for contracts with the commonwealth not awarded as provided in sections forty-four A to forty-four L, inclusive, of chapter one hundred forty-nine shall also mean a person contracting with the general contractor to supply materials used or employed in a public works project for a price in excess of five thousand dollars.*

*(4) A general contractor or a subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposit as provided in subparagraph (6) by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in subparagraph (6) by a petition in equity in the superior court against the Awarding Authority and the general contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this paragraph. Sections fifty-nine and fifty-nine B of chapter two hundred thirty-one shall apply to such petitions. The court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to sections fifty-nine and fifty-nine B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The court shall not consolidate for trial the petition of any subcontractor with the petition of one or more subcontractors or the same general Contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a subcontractor filing a demand for direct payment for which no funds due the general contractor are available for direct payment shall have a right to file a petition in court of equity against the Awarding Authority claiming a demand for direct payment is premature and such subcontractor must file the petition before the Awarding Authority has made a direct payment to the subcontractor and has made a deposit of the disputed portion as provided in part (iii) of subparagraph (5) and in subparagraph (6).*

***(5) In any petition to collect any claim for which a subcontractor has filed a demand for direct payment the court shall, upon motion of the general contractor, reduce by the amount of any deposit of a disputed amount by the Awarding Authority as provided in part (iii) of subparagraph (5) and in subparagraph (6) any amount held under a trustee writ or pursuant to a restraining order or injunction. ”***

**7. Final Payment: Release of Claims by CM**

Upon Final Acceptance of the Work the CM shall be entitled to payment of the balance of the Contract Price. Final payment shall be as provided in this Article above and in accordance with any process set forth in the Contract Documents. The CM agrees to execute a Certificate of Final Inspection, Release (with CM's own exceptions listed thereon) and Acceptance as a condition precedent to Final Payment. The acceptance by the CM of the Final Payment made as aforesaid, or the execution of the Certificate of Final Acceptance by the CM, shall constitute a release of the Owner, the City of Worcester, the Designer, and every member and agent of any of them, from all claims of and liability to the CM for anything done or furnished for or relating to the Work, or for any act or neglect of the Owner, the Designer, or of any person relating to or affecting the Work, except the claim against the Owner or the Designer for the remainder, if any there be, of the amounts set forth by the CM in the Certificate of Final Inspection, Release and Acceptance. Final Acceptance shall not relieve CM of the requirements of Articles IX, XIV, and XV of these General Conditions of the Contract, or of other provisions of this Contract, to the extent that the same are intended to survive Final Acceptance.

**ARTICLE IX**  
**GUARANTEES AND WARRANTIES**

**1. General Warranty**

If at any time during the period of one (1) year from the date of the issuance of the Certificate of Agency Use and Occupancy by the City of Worcester or the date of Final Acceptance, whichever occurs first, any part of such Work shall in the reasonable opinion of the City of Worcester be defective or require replacing or repairing, or damage to other property of the Owner is caused by any defect in the Work, the City of Worcester shall notify the CM in writing to make the required repairs or replacements and repair such damage. If the CM shall neglect to commence such repairs or replacements to the satisfaction to the City of Worcester within ten (10) days from the date of the giving of such notice, then the City of Worcester may employ other persons to make the same. The CM agrees, upon demand, to pay to the City of Worcester all amounts which it expends for such repairs, replacements, and/or damages. During this one-year guarantee period any corrective work shall be performed under all the applicable terms of this Contract, and if Change Orders are issued in accordance with the terms of this Contract, the CM shall be entitled to compensation for special insurance, as required. This one-year guarantee shall not limit any express guaranty or warranty provided elsewhere in the Contract.

**2. Special Guarantees and Warranties**

A. The CM's obligation to correct Work as set forth in paragraph 1 above is in addition to, and not in substitution of, such guarantees or warranties as may be required in the various sections of the Specifications.

B. Guarantees and warranties required in the various sections of the Specifications must be delivered to the Designer before final payment to the CM may be made, or in the case of guarantees and warranties which originate with a subcontractor's section of the



Work, before final payment for the amount of that subtrade or for the phase of Work to which the guarantee or warranty relates.

C. The failure to deliver a required guarantee or warranty shall constitute a failure to fully complete the Work in accordance with the Contract Documents.

## **ARTICLE X**

### **MISCELLANEOUS LEGAL REQUIREMENTS**

#### **1. CM to be Informed**

The CM shall inform itself of all existing and future Laws in any manner affecting those engaged or employed in the Work, or the materials used or employed in the Work, or in any way affecting the conduct of the Work, and of all orders and decrees of bodies or tribunals having any applicable jurisdiction or authority over the Work.

#### **2. Compliance with all Laws**

The CM shall cause all persons employed in the performance of the Work to comply with, all existing and future Laws, including but not limited to those set forth below:

**A. Corporate Disclosures.** The CM, if a foreign corporation, shall comply with M.G.L. c. 181, s.3 and s. 5, and M.G.L. c. 30, s.39L.

**B. Veterans Preference.** In the employment of mechanics and apprentices, teamsters, chauffeurs, and laborers in the performance of Work in the Commonwealth, preference shall first be given to citizens of the Commonwealth who have been residents of the Commonwealth for at least six months at the commencement of their employment and who are veterans as defined M.G.L. c.4, s.7 (34), and who are qualified to perform the work to which the employment relates; and secondly, to citizens of the Commonwealth generally who have been residents of the Commonwealth for at least six months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States.

**C. Prevailing Wages.** The CM shall comply with M.G.L. c. 149, s. 26- 27H. The prevailing wage schedule is found in Exhibit C to the Owner-CM Agreement, listing the prevailing minimum wage rates that must be paid to all workers employed in the Work. the City of Worcester is not responsible for any errors, omissions, or misprints in the said schedule. Such Schedule shall continue to be the minimum rate wages payable to workers employed in the Work throughout the term of this Contract, subject to the exceptions provided in M.G.L c.149, s. 26-27H. The CM shall not have any claim for extra compensation from the Owner if the actual wages paid to workers employed in the Work exceeds the rates listed on the schedule or as otherwise provided by law. The CM shall cause a copy of said Schedule to be kept in a conspicuous place at the Site during the term of the Contract. If reserve police officers are employed by the CM, they shall be paid the prevailing wage of regular police officers. (See M.G.L c.149, s.34B).

**D. Payroll Records and Statement of Compliance.** The CM shall comply and shall cause its Subcontractors to comply with Massachusetts General Law c. 149, s. 27B, which requires that a true and accurate record be kept of all persons employed on the a project for which the prevailing wage rates have been provided. The CM and all Subcontractors shall keep these records and preserve them for a period of three years from the date of completion of the Contract. Such records shall be open to inspection by

any authorized representative of the Owner at any reasonable time, and as often as may be necessary. The CM shall, and shall cause its Subcontractors to, submit weekly copies of their weekly payroll records to the City of Worcester. In addition, the CM and each Subcontractor shall furnish to the Executive Department of Labor within fifteen days after completion of its portion of the Work a signed statement in the form required by the City of Worcester.

**E. Vehicle operators.** If the Director of the Department of Labor and Workforce Development has established a Schedule of wage rates to be paid to the operators of trucks, vehicles or equipment for the Work, the CM shall be obligated to pay such operators at least the minimum wage rate contained on such Schedule. (See M.G.L. c.149, s.26-27H).

**F. Eight Hour Day.** The CM shall comply with M.G.L. c. 149, s. 30, 34 and 34A which provide that no laborer, workman, mechanic, foreman or inspector working within the Commonwealth in the employ of the CM, subcontractor or other person doing or contracting to do the whole or part of the Work shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of extraordinary emergency.

**G. Timely Payment of Wages.** The CM shall comply with, and shall cause its Subcontractors to comply with M.G.L. c. 149, s. 148 which requires the weekly or biweekly payment of employees within six days of the end of the pay period during which wages were earned if employed for five or six days of a calendar week, and within other periods of time under certain circumstances as set forth therein.

**H. Lodging, etc.** The CM shall comply with, and shall cause its Subcontractors to comply with, M.G.L. c. 149, s. 25 which provides that every employee under this Contract shall lodge, board and trade where and with whom he elects, and neither the CM nor his agents or employees shall, either directly or indirectly, require as a condition of the employment of any person that the employee shall lodge, board or trade at a particular place or with a particular person.

**I. Truck Rates.** The use by the CM of trucks or other motor vehicles hired from either common or contract motor carriers in the course of performance of this Contract is subject to such minimum rates and charges, and rules and regulations as may from time to time be promulgated by the Department of Public Utilities of the Commonwealth of Massachusetts or other agency of the State or Federal government which may be authorized by law to set rates or otherwise regulate the use of such vehicles. The CM expressly assumes the risk of any additional expense that may arise by reason of any change in such minimum rates and charges, and rules and regulations, and shall be entitled to no additional compensation or reimbursement by reason thereof.

**J. Anti-Boycott Covenant (Executive Order #130).** The CM warrants, represents and agrees that during the time this Contract is in effect, neither it or any affiliated company, as hereafter defined, participates in or cooperates with an international boycott, as defined in Section 999(b) (3) and (4) of the Internal Revenue Code of 1954, as amended, or engages in conduct declared to be unlawful by M.G.L. c. 151E, s. 2. If there shall be a breach in the warranty, representation or agreement contained in this paragraph, then without limiting such other rights as it may have the Awarding Authority shall be entitled to rescind this contract. As used herein, an affiliated company shall be any business entity of which at least 51% of the ownership interests are directly or indirectly owned by the CM or by a person or persons or business

entity or entities directly or indirectly owning at least 51% of the Ownership interests of the CM; or which directly or indirectly owns at least 51% of the Ownership interests of the CM.

**K. CM's Agreements with Suppliers--Anti-Boycott Provisions.** (1) The CM shall not purchase or rent any materials, equipment, machinery, vehicles, or supplies for or in connection with the Work from any person or entity who does not sign, under pains and penalties of perjury, a certificate that recites: "The undersigned warrants, represents and agrees that during the time its agreement with {insert CM's name} is in effect for materials, supplies or equipment to be used in connection with the {insert the name of the Awarding Authority} Project No. {insert project number}, neither the undersigned or any affiliated company, as hereafter defined, participates in or cooperates with an international boycott, as defined in Section 999(b)(3) and (4) of the Internal Revenue Code of 1954, as amended, or engages in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws. As used herein, an affiliated company shall be any business entity of which at least 51% of the ownership interests are directly or indirectly owned by the undersigned or by a person or persons or business entity or entities directly or indirectly owning at least 51% of the ownership interests of the undersigned; or which directly or indirectly owns at least 51% of the ownership interests of the undersigned."

- (1) The Awarding Authority shall not be obligated to pay the CM for the cost of any materials, supplies, or equipment purchased or rented from any individual or entity from whom the CM has not previously obtained and delivered to the Awarding Authority the certificate that the previous paragraph requires. The CM will immediately terminate its contract with any supplier who breaches the warranty, representation and agreement contained in the previous paragraph.
- (2) The CM shall include in the CM's agreement with any person or entity from whom the CM intends to purchase or rent any materials, equipment, machinery, vehicles or supplies for or in connection with the Work, (a) a notice that this Contract obligates the CM to terminate the supply contract upon discovery of such breach of the sworn certificate delivered under subparagraph (1) and such termination shall be without liability to the CM or the Awarding Authority and (b) a provision which states: "The Governor or his designee, the secretary of administration and finance, and the state auditor or his designee shall have the right at reasonable times and upon reasonable notice to examine the books, records and other compilations of the undersigned vendor which pertain to the performance and requirements of this agreement to provide materials of any nature to the undersigned Contractor [CM] in connection with State Project No. (insert project number)."

**L. Access to CM's Records (Executive Order #195). The Governor or his designee, the secretary of administration and finance, and the state auditor or his designee shall have the right at reasonable times and upon reasonable notice to examine the books, records and other compilations of data of the CM which pertain to the performance and requirements of this Contract.**

## **ARTICLE XI**

### **CM'S ACCOUNTING METHOD REQUIREMENTS (M.G.L. c. 30, s. 39R)**

#### **1. Definitions**

The words defined herein shall have the meaning stated below whenever they appear in this Article XI:

***Contractor*** means the CM.

***Contract*** means any Contract awarded, which is for an amount or estimated amount greater than one hundred thousand dollars.

***Independent Certified Public Accountant*** means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his/her residence or principal office and who is in fact independent. In determining whether an accountant is independent with aspect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the City of Worcester.

***Records*** means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

***Audit***, when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons, or other person or persons primarily responsible for the financial and operational policies and practices of the Contractor.

Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

#### **2. Record Keeping**

A. The Contractor shall make, and keep for at least six years after final payment, books, records, and accounts that in reasonable detail accurately and fairly reflect the transactions and dispositions of the Contractor.

B. Until the expiration of six years after final payment, the Inspector General, the City of Worcester, and the City of Worcester shall have the right to examine any books, documents, papers or records of the Contractor and Subcontractors that directly pertain to, and involve transactions relating to the Contractor and Subcontractors. Any request for a change in the provisions of this Contract submitted by the CM must be made in writing and in accordance with the provisions of this Contract, including the procedures of the City of Worcester.

C. The Contractor shall describe any change in the method of maintaining records or recording transactions which materially affects any statements filed with the City of Worcester including the date of the change and reasons therefor, and shall accompany said description with a letter from the Contractor's independent certified public accountant approving or otherwise commenting on the changes.

D. The Contractor represents that it has, prior to the execution of the Contract, filed a statement of management on internal accounting controls as set forth in Section 3 below.

E. The Contractor represents that it has, prior to the execution of the Contract, filed an audited financial statement for the most recent completed fiscal year as set forth in section 4 below and will continue to file such statement annually during the term of the Contract.

### **3. Statement of Management Controls**

A. The Contractor shall file with the City of Worcester a statement of management as to whether the system of internal accounting controls of the Contractor and its subsidiaries reasonably assures that:

- (1) transactions are executed in accordance with management's general and specific authorization;
- (2) transactions are recorded as necessary to: (a) to permit preparation of financial statements in conformity with generally accepted accounting principles, and (b) to maintain accountability for assets;
- (3) access to assets is permitted only in accordance with management's general or specific authorization; and
- (4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

B. The Contractor shall file with the City of Worcester a statement prepared and signed by an independent certified public accountant, stating that the accountant has examined the statement of management on internal accounting controls, and expressing an opinion as to:

- (1) whether the representations of management in response to subparagraph 3 above are consistent with the results of management's evaluation of the system of internal accounting controls; and
- (2) whether such representations of management are reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statement.

### **4. Annual Financial Statement**

A. Every Contractor awarded a contract shall annually file with the City of Worcester during the term of the Contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report.

B. The office of Inspector General and the City of Worcester shall have the right to enforce the provisions of this Article. A Contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to M.G.L. c. 149, s. 44C.

### **5. Bid Pricing Materials**

The Contractor shall save the written calculations, pricing information, and other data that the Contractor used to calculate the bid that induced the City of Worcester to enter

into this Contract (the "Bid Pricing Materials") for at least six years after the City of Worcester makes final payment under this Contract.

**ARTICLE XII**  
**EQUAL EMPLOYMENT OPPORTUNITY,  
NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM**

This Contract includes all provisions of the City of Worcester's "Equal Employment Opportunity, Non-Discrimination, and Affirmative Action Program" appearing in Appendix A to these General Conditions of the Contract attached hereto and incorporated herein by reference.

**ARTICLE XIII**  
**GOALS FOR PARTICIPATION BY  
MINORITY BUSINESS ENTERPRISES  
AND WOMEN BUSINESS ENTERPRISES  
(EXECUTIVE ORDER 390)**

This Contract includes all provisions of the City of Worcester's program relating to Goals for Participation by Minority Business Enterprises and Women Business Enterprises attached appearing in Appendix B to these General Conditions of the Contract attached hereto and incorporated herein by reference.

**ARTICLE XIV**  
**INSURANCE REQUIREMENTS**

**1. Insurance Generally**

A. The CM shall take out and maintain the insurance coverages listed in this Article with respect to the operations as well as the completed operations of this Contract. This insurance shall be provided at the CM's expense and shall be in full force and effect for the full term of the Contract or for such longer period as this Article requires.

B. All policies shall be written on an occurrence basis and be issued by companies authorized to write that type of insurance under the laws of the Commonwealth and rated in Best's Insurance Guide (or any successor thereto or replacement thereof) as having a general policy holder rating of "A" or better and a financial rating of at least "9" or otherwise acceptable to the City of Worcester.

C. CM shall submit three originals of each certificate of insurance, acceptable to the City of Worcester, simultaneously with the execution of this Contract. Certificates shall show the City of Worcester and the Owner as an additional insured as to all policies of liability insurance and shall state that CM has paid all premiums and that none of the coverages shall be cancelled, terminated, or materially modified unless and until 30 days prior notice is given in writing to the City of Worcester. Contractor shall submit updated certificates prior to the expiration of any of the policies referenced in the certificates so that

the City of Worcester shall at all times possess certificates indicating current coverage. Certificates shall indicate that the contractual liability coverage, and Contractor's Protective Liability coverage is in force. Certificates shall include specific acknowledgment that the following coverages are included in the policies:

- Contractual liability
- Contractor's protective
- Owner as additional insured by form CG2010 (11/85 ed.) to the general liability
- Owner as additional insured to automobile liability, umbrella liability, and pollution liability
- General Liability is endorsed with CG2404, Waiver of Subrogation, in favor of the Owner
- Builder's Risk or Installation Floater includes Owner, CM and subcontractors of any tier as named insureds. Builder's Risk or Installation Floater is on an All Risk basis including earthquake and flood.

**D.** The CM shall file one certified copy of all policies with the City of Worcester within sixty days after Contract award. If the City of Worcester or the Owner is damaged by the CM's failure to maintain such insurance and to comply with the terms of this Article, then the CM shall be responsible for all costs and damages to the Owner attributable thereto.

**E.** Termination, cancellation, or material modification of any insurance required by this Contract, whether by the insurer or the insured, shall not be valid unless written notice thereof is given to the City of Worcester at least thirty days prior to the effective date thereof, which shall be expressed in said notice

## **2. CM's Commercial General Liability**

**A.** The CM shall provide the following minimum general liability coverage with respect to the operations performed by CM and any employee, subcontractor, or supplier, unless a higher coverage is specified in Exhibit A to the Owner-CM Agreement, in which case the CM shall provide the additional coverage:

|                                 |  |
|---------------------------------|--|
| Bodily Injury                   | \$1,000,000 each occurrence                |
| Property Damage                 | \$2,000,000 general aggregate, per project |
| Products & Completed Operations | \$1,000,000 annual aggregate               |
| Personal & Advertising Injury   | \$1,000,000 each occurrence                |
| Medical Expenses                | \$10,000                                   |
| Fire Damage Liability           | \$100,000                                  |

**B.** This policy shall include coverage relating to explosion, collapse, and underground property damage.

**C.** This policy shall include contractual liability coverage.

**D.** The completed operations coverage shall be maintained for a period of three (3) years after Substantial Completion.

E. If the Work includes work to be performed within 50 feet of a railroad, any exclusion for liability assumed under contract for work within 50 feet of a railroad shall be deleted.

F. This policy shall include endorsement CG2010 (10/85 edition), *Owner as Additional Insured* and CG2404 (11/85 edition) *Waiver of Subrogation in Favor of Owner*.

### 3. **Vehicle Liability**

A. The CM shall provide the following minimum coverage with respect to the operations of any employee, including coverage for owned, non-owned, and hired vehicles, unless a higher coverage is specified in Exhibit A to the Owner-CM Agreement, in which case the CM shall provide the additional coverage:

Combined Single Limit                      \$1,000,000

B. The policy shall include a CA9948 Pollution Endorsement and shall name the Owner as an Additional Insured.

### 4. **Pollution Liability**

The CM shall provide coverage for bodily injury and property damage resulting from liability arising out of pollution related exposures such as asbestos abatement, lead paint abatement, tank removal, removal of contaminated soil, etc. the City of Worcester and the Owner shall be named as an additional insured and coverage must be on an occurrence basis. The amount of coverage shall be \$1,000,000 per occurrence and \$3,000,000 in the aggregate unless a higher amount is specified in Exhibit A to the Owner-CM Agreement, in which case the CM shall provide the additional coverage.

### 5. **Worker's Compensation**

A. The CM shall provide the following coverage in accordance with M.G.L. c.149 §34A and c.152 as amended, unless a higher coverage is specified in Exhibit B to the Owner-CM Agreement, in which case the CM shall provide the higher coverage:

#### **Worker's Compensation**

Part One: Provide Statutory Minimum

Employer's Liability — \$ 500,000 each accident

Part Two: \$ 500,000 disease per employee

\$500,000 disease policy aggregate

B. If specified in Exhibit A to the Owner-CM Agreement the policy must be endorsed to cover United States Longshoremen & Harborworkers Act (USLHW), Maritime Liability for \$1,000,000/\$1,000,000, or Federal Employer's Liability Act liability.

### 6. **Builder's Risk/Installation Floater/Stored Materials**

A. The CM shall provide coverage against loss or damage on all Work included in this Contract in an amount equal to the GMP. Such coverage shall be written on an all risks basis or equivalent form and shall include, without limitation, insurance against perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood (if the project is not in an "A" or a "V" flood Zone), windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and



CM's services and expenses required as a result of such insured loss. This policy and/or installation floater shall indicate if Stored Materials coverage is provided as required below.

**B.** When Work will be completed on existing buildings owned by the Owner, the CM shall provide an installation floater, in the full amount of the Contract Price. Such coverage shall be written on an all risks basis or equivalent form and shall include, without limitation, insurance against perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood (if the project is not in an "A" or a "V" flood Zone), windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's, Program Manager's and CM's services and expenses required as a result of such insured loss. This policy and/or installation floater shall indicate if Stored Materials coverage is provided as required below.

**C.** The CM shall maintain insurance on delivered and/or stored material designated to be incorporated in the Work against fire, theft or other hazards. Any loss or damage of whatever nature to such material while stored at some approved off Site location shall be forthwith replaced by the CM at no expense to the City of Worcester.

**D.** The policy or policies shall specifically state they are for the benefit of and payable to the City of Worcester, the CM, subcontractors and all persons furnishing labor or labor and materials for the Contract Work, as their interests may appear. The policy or policies shall list the City of Worcester, the CM, and Subcontractors of any tier as named insureds.

**E.** Coverage shall include any costs for work performed by the Designer or any consultant as the result of a loss experienced during the term of this Contract.

**F.** Coverage shall include temporary occupancy and waiver of subrogation.

## **7. Umbrella Coverage**

The CM shall provide Umbrella Coverage in form at least as broad as primary coverages required by Sections 2, 3 and 5 of this Article in the following amount unless a higher amount is specified in Exhibit A to the Owner-CM Agreement, in which case the CM shall provide the higher amount:

| <b><u>Umbrella Coverage</u></b> | <b><u>GMP Amount</u></b> |
|---------------------------------|--------------------------|
| Under \$1,000,000               | \$ 2,000,000             |
| \$1,000,000 -- \$5,000,000      | \$ 5,000,000             |
| \$5,000,001-- \$10,000,000      | \$ 10,000,000            |
| \$10,000,001 and over           | \$ 25,000,000            |

## **8. Additional types of Insurance and Deductibles**

The CM shall provide such other types of insurance as may be required by Exhibit A to the Owner-CM Agreement. If the policies required herein contain deductible amounts, the CM shall be responsible for such deductible amounts, unless the City of Worcester specifically provides a written waiver to the CM.

# **ARTICLE XV** **INDEMNIFICATION**

## **1. Generally**

To the fullest extent permitted by law, the CM shall indemnify, defend (with counsel subject to the supervision of the Attorney General of the Commonwealth of Massachusetts as required by M.G.L. c. 12, s. 3) and hold harmless the City of Worcester and their officers, agents, divisions, agencies, employees, representatives, successors and assigns from and against all claims, damages, losses and expenses, including but not limited to court costs and attorneys' fees, arising out of or resulting from the performance of the Work, including but not limited to those arising or resulting from:

- labor performed or furnished and/or materials used or employed in the performance of the Work;
- violations by CM, any Subcontractor, or by any person directly or indirectly employed or used by any of them in the performance of the Work or anyone for whose acts any of them may be liable (CM, subcontractor and all such persons herein collectively called "CM's Personnel") of any Laws;
- violations of any provision of this Contract by CM or its subcontractors, suppliers or any other person or firm providing labor and/or materials for the work.;
- injuries to any persons or damage to any property in connection with the Work; or
- any act, omission, or neglect of CM's Personnel.

The CM shall be obligated as provided above, regardless of whether or not such claims, damages, losses and/or expenses, are caused in whole or in part by the actions or inactions of a party indemnified hereunder. In any and all claims by CM's Personnel against parties indemnified hereunder, the CM's indemnification obligation set forth above shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the CM or any subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Article XV.

## **2. Designer's Actions**

The obligations of the CM under Section 1 above shall not extend to the liability of the Designer, its agents or employees, arising out of (i) the preparation or approval of maps, Drawings, opinions, reports, surveys Change Orders, designs or Specifications, or (ii) the giving of or the failure to give directions or instructions by the Designer, its agents to employees provided such giving or failure to give is the primary cause of the injury or damage.

## **3. Survival**

The provisions of this Article XV are intended to survive Final Acceptance and/or any termination of this Contract.

# **ARTICLE XVI** **PERFORMANCE AND PAYMENT BONDS**

## **1. CM Bonds**

A. The CM shall provide performance and payment (labor and materials) bonds in the form provided by the City of Worcester, executed by a surety licensed by the

Commonwealth of Massachusetts Division of Insurance. Each such bond shall be in the amount of the GMP.

**B.** If at any time prior to final payment to the CM, the Surety:

- is adjudged bankrupt or has made a general assignment for the benefit of its creditors;
- has liquidated all assets and/or has made a general assignment for the benefit of its creditors;
- is placed in receivership;
- otherwise petitions a state or federal court for protection from its creditors; or
- allows its license to do business in Massachusetts to lapse or be revoked;
- then the CM shall, within 21 days of any such action listed above, provide the City of Worcester with new performance and payment bonds as described in Paragraph A above. Such bonds shall be provided solely at the CM's expense.

## **2. Subcontractor Bonds**

**A.** If the CM provided in its Guaranteed Maximum Price or other Proposal, that any or all subcontractors shall provide the CM with payment and performance bonds for the full amount of their respective Subcontracts, then the costs for said bonds shall be the responsibility of the CM. Irrespective of whether the CM requests payment and performance bonds from their respective Subcontractors, the CM understands that if the Subcontractor defaults or is terminated, the CM shall have full responsibility for all costs and expenses related to said default or termination.

**B.** If the CM provided in its General Bid that Subcontractors shall provide bonds, and subsequently waives the requirement, the CM shall give the City of Worcester a written certification that the CM understands that if the Subcontractor defaults or is terminated, the CM shall have full responsibility for all costs and expenses related to said default or termination.

## **ARTICLE XVII** **TERMINATION OF CONTRACT**

### **1. Termination for Cause**

**A.** the City of Worcester may without prejudice to any other right or remedy deem this Contract terminated for cause if any of the following defaults shall occur and not be cured within three (3) days after the giving of written notice thereof by the City of Worcester to the CM and any surety that has given bonds in connection with this Contract:

- (1) The CM has filed a petition, or a petition has been filed against the CM with its consent, under any federal or state law concerning bankruptcy, reorganization, insolvency or relief from creditors, or if such a petition is filed against the CM without its consent and is not dismissed within sixty (60) days; or if the CM is generally not paying its debts as they become due; or if the CM becomes insolvent; or if the CM consents to the appointment of a receiver, trustee, liquidate, custodian or the like of the CM or of all or any substantial portion of its assets and such appointment or possession is not terminated within sixty (60) days; or if the CM makes an assignment for the benefit of creditors;
- (2) The CM refuses or fails, except in cases for which extension of time is provided under this Contract's express terms, to supply enough properly skilled workers or

proper materials to perform its obligations under this Contract, or the City of Worcester has determined that the rate of progress required for the timely completion of the Work is not being met;

- (3) The CM fails to make prompt payment to Subcontractors or for materials, equipment, or labor;
- (4) All or a part of the Work has been abandoned;
- (5) The CM has sublet or assigned all or any portion of the Work, the Contract, or claims thereunder, without the prior written consent of the Owner, except as expressly permitted in this Contract;
- (6) The CM has failed to comply with Laws;
- (7) The CM fails to maintain, or provide to the City of Worcester evidence of the insurance or bonds required by this Contract, or
- (8) The CM has failed to perform the Work or any portion thereof as required by this Contract or has otherwise breached any material provision of this Contract.

**B.** the City of Worcester shall give the CM and any surety notice of such termination for cause, but the giving of notice of such termination shall not be a condition precedent or subsequent to the termination's effectiveness. In the event of such termination, and without limiting any other available remedies, the City of Worcester may, at its option:

- (1) hold the CM and its sureties liable in damages for a breach of Contract;
- (2) notify the CM to discontinue all work, or any part thereof, and the CM shall discontinue all work, or any part thereof, as the Owner may designate;
- (3) complete the Work, or any part thereof, and charge the expense of completing the Work or part thereof, to the CM;
- (4) require the surety or sureties to complete the Work and perform all of the CM's obligations under this Contract.
- (5) take such other lawful action as is deemed by the City of Worcester to be in the best interest of the Commonwealth.

If the City of Worcester elects to complete all or any portion of the Work as specified in (3) above, it may take possession of all materials, equipment, tools, machinery, implements at or near the Site owned by the CM and finish the Work at the CM's expense by whatever means the City of Worcester may deem expedient; and the CM shall cooperate at its expense in the orderly transfer of the same to a new contractor or to the City of Worcester as directed by the City of Worcester. In such case the City of Worcester shall not make any further payments to the CM until the Work is completely finished. The Owner shall not be liable for any depreciation, loss or damage to said materials, machinery, implements or tools during said use and the CM shall be solely responsible for their removal from the Site after the Owner has no further use for them. Unless so removed within fifteen days after notice to the CM to do so, they may be sold at public auction, after publication of notice thereof at least twice in any newspaper published in the county where the Work is being performed, and the proceeds credited to the CM's account; or they may, at the option of the City of Worcester, be stored at the CM's expense subject to a lien for the storage charges.

**C.** Damages and expenses incurred under paragraph B above shall include, but not be limited to, costs for the Designer's extra services required, in the opinion of the City of Worcester, to successfully inspect and administer the construction contract through final completion of the Work.

D. Expenses charged under paragraph B above may be deducted and paid by the City of Worcester out of any moneys then due or to become due the CM under this Contract.

E. All sums damages, and expenses incurred by the Owner to complete the Work shall be charged to the CM. In case the damages and expenses charged are less than the sum that would have been payable under this Contract if the same had been completed by the CM, the CM shall be entitled to receive the difference. In case such expenses shall exceed the said sum, the CM shall pay the amount of the excess to the Owner.

## **2. Termination for Convenience**

A. the City of Worcester may terminate this Contract for convenience even though the CM is not in default by giving notice to the CM specifying in said notice the date of termination.

B. In case of such termination without cause, the CM shall be paid:

(1) all sums due and owing under this Contract through the date of termination, including any retainage withheld to the date of termination, less any amount which the City of Worcester determines is necessary to correct or complete the Work performed to the date of termination; plus (2) a reasonable sum to cover the expenses which CM would not have incurred but for the early termination of the Contract, such as demobilization of the work force, restocking charges, termination fees payable to Subcontractors.

C. Lost profits shall not be payable. The payment provided in paragraph B above shall be considered to fully compensate the CM for all claims and expenses and those of any consultants, Subcontractors, and suppliers, directly or indirectly attributable to the termination.

## **3. CM's Duties upon Termination for Convenience**

Upon termination of this Contract for convenience as provided in Section 2 of this Article, the CM shall: (1) stop the Work; (2) stop placing orders and Subcontracts in connection with this Contract; (3) cancel all existing orders and Subcontracts; (4) surrender the Site to the City of Worcester in a safe condition; (5) transfer to the City of Worcester all materials, supplies, work in process, appliances, facilities, equipment and machinery of this Contract, and all plans, Drawings, Specifications and other information and documents used in connection with this Contract.

# **ARTICLE XVIII** **MISCELLANEOUS PROVISIONS**

## **1. No Assignment by CM**

The CM shall not assign by power of attorney or otherwise, or sublet or subcontract, the Work or any part thereof, without the previous written consent of the City of Worcester and shall not, either legally or equitably, assign any of the moneys payable under this Contract, or CM's claims hereunder, unless with the like consent of the City of Worcester, whether said assignment is made before, at the time of, or after the execution of the Contract. The CM shall remain responsible for satisfactory performance of all Work sublet or assigned complying with all applicable requirements of the Contract. Consent of the City of Worcester shall not be deemed to constitute a representation or waiver of any right hereunder by the City of Worcester as to the qualifications or the responsibility of the CM or Subcontractor(s).

## **2. Non-Appropriation**

The Commonwealth certifies that at the time of the execution of this Contract, sufficient appropriations exist and shall be encumbered to fund the Contract Price. Payments are subject to appropriation and shall be made only for work performed in accordance with the terms of this Contract. The CM shall not be obligated to perform, and shall not perform, work outside the scope of this Contract without an appropriate amendment to this Contract, and a sufficient appropriation(s) to support such additional work. The Commonwealth may immediately terminate or suspend this Contract in the event that the appropriation(s) funding this Contract is eliminated or reduced to an amount which will be insufficient to support anticipated future obligations under this Contract. Such termination shall be deemed a termination for convenience subject to the provisions of paragraph 2 of Article XVII of this Contract.

**3. Claims by Others Not Valid**

No person other than the CM and the surety on any bond given pursuant to the terms of this Contract shall acquire any interest in this Contract or any claim against the City of Worcester hereunder, and no claim by any other person shall be valid except as provided in M.G.L. c. 30, s. 39F of the General Laws.

**4. No Personal Liability of Public Officials**

No public official, employee, or agent of the City of Worcester shall have any personal liability for the obligations of the City of Worcester set forth in this Contract.

**5. Severability**

The provisions of this Contract are severable, and if any of these provisions shall be held unconstitutional or unenforceable by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the other provisions of this Contract.

**6. Choice of Laws**

This Contract shall be governed by the laws of the Commonwealth of Massachusetts for all purposes, without regard to its laws on choice of law. All proceedings under this Contract or related to the Project shall be brought in the courts of the Commonwealth of Massachusetts.

**7. Standard Forms**

Unless directed otherwise in writing by the City of Worcester, CM shall use the standard forms in use by the Division of Capital Asset Management and Maintenance appearing in Appendix E to these General Conditions of the Contract.

**8. No Waiver of Subsequent Breach**

No waiver of any breach or obligation of this Contract shall constitute a waiver of any other or subsequent breach or obligation.

**9. Remedies Cumulative**

All remedies of the City of Worcester provided in this Contract shall be construed as cumulative and may be exercised simultaneously or in any order as determined by the

City of Worcester in its sole discretion. the City of Worcester shall also be entitled as of right to specific performance and equitable relief including the right to an injunction against any breach of any of the provisions of this Contract

**10. Notices**

Notices to the CM shall be deemed given when hand delivered to the CM's temporary field office at or near the Site, or when deposited in the U.S. mail addressed to the CM at the CM's address specified in the Owner-CM Agreement, or when delivered by courier to either location. Unless otherwise specified in writing by the City of Worcester, notices and deliveries to the City of Worcester shall be effective only when delivered to the City of Worcester at the address specified in the Owner-CM Agreement and date-stamped at the reception desk or for which a receipt has been signed by the agent or employee designated by the City of Worcester to receive official notices.

**END OF SECTION 00200**

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## **APPENDIX A**

The following provisions form Article XII of the General Conditions of the Contract between the City of Worcester and the Construction Manager.

### **EQUAL EMPLOYMENT OPPORTUNITY, NON-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM**

#### **1. Compliance Generally**

For purpose of this Article, "minority" refers to Asians, Blacks, Western Hemisphere Hispanics, Native Americans, and Cape Verdeans; "Commission" refers to the Massachusetts Commission Against Discrimination. During the performance of this Contract, the Construction Manager and all of its Subcontractors (hereinafter collectively referred to as the Contractor) shall comply with all applicable equal employment opportunity, non-discrimination and affirmative action requirements, including but not limited to the following:

#### **2. Non-Discrimination and Affirmative Action**

**A.** The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, age, handicap, sexual orientation, or sex. The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion or transfer; recruitment advertising; recruitment layoff; termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship. The Contractor shall comply with the provisions of M.G.L. c. 151B and all other applicable anti-discrimination and equal opportunity laws.

**B.** The Contractor shall comply with the provisions of Executive Order No. 246 entitled Revoking and Superseding Executive Orders Numbers 143 and 150, with respect to affirmative action programs for handicapped individuals, which is herein incorporated by reference and made a part of this Contract.

**C.** In connection with the performance of the Work, the Contractor shall undertake in good faith affirmative action measures designed to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, age, sexual orientation, or sex, and to eliminate and remedy any effects of such discrimination in the past. Such affirmative action shall entail positive and aggressive measures to ensure equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, and in-service or apprenticeship training programs. This affirmative action shall include all action required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, age, sexual orientation, or sex. A purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradesmen for future public construction projects.

**D.** If the Contractor shall use any subcontractor on any work performed under this Contract, the Contractor shall take affirmative steps to negotiate with qualified minority and women subcontractors. These affirmative steps shall cover both pre-bid and post-bid periods. It shall include notification to the State Office of Minority and Women Business Assistance or its designee, while bids are in preparation, of all products, work or services for which the Contractor intends to negotiate bids. In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or equipment, each potential subcontractor or supplier shall be notified in writing by the Contractor of the Contractor's obligations under this Contract relative to non-discrimination and affirmative action.

**E.** As part of its obligation of remedial action under this Article, the Contractor shall maintain on this project not less than the percent ratio set forth in the Owner – Construction Manager Agreement of minority employee worker hours to total worker hours in each job category including but not limited to bricklayers, carpenters, cement masons, electricians, ironworkers, operating engineers, and those "classes of work" enumerated in M.G. L. c. 149, s. 44F.

F. In the hiring of minority journeypersons, apprentices, trainees and advanced trainees, the Contractor shall rely on referrals from a multi-employer affirmative action program approved by the Commission, traditional referral methods utilized by the construction industry, and referrals from agencies, not more than three in number at any one time, designated by the City of Worcester.

### **3. Liaison Committee. Reports and Records**

A. At the option of the City of Worcester there may be established for the term of this Contract a body to be known as the Liaison Committee. The Liaison Committee shall be composed of one representative each from the Awarding Authority, and such other representatives as may be designated by the City of Worcester. The Contractor (or his agent, if any, designated by him as the on-Site equal employment opportunity officer) shall recognize the Liaison Committee as an affirmative action body, and shall establish a continuing working relationship with the Liaison Committee, consulting with the Liaison Committee on all matters related to minority recruitment, referral, employment and training.

B. The Contractor shall prepare projected staffing tables on a quarterly basis. These shall be broken down into projections, by week, of workers required in each trade. Copies shall be furnished one week in advance of the commencement of the period covered, and also when updated, to the Awarding Authority. The Contractor shall prepare weekly reports in a form approved by the Awarding Authority of hours worked in each trade by each employee, identified as minority or non-minority. Copies of these shall be provided at the end of each such week to the Awarding Authority and to the Liaison Committee.

C. Records of employment referral orders, prepared by the Contractor, shall be made available to the Awarding Authority on request.

D. A designee of the Awarding Authority shall each have right to access to the Site.

E. The Contractor shall comply with the provisions of M.G.L. c. 151B as amended, of the Massachusetts General Laws, both of which are herein incorporated by reference and made a part of this Contract.

F. The Contractor shall provide all information and reports required by the Awarding Authority on forms and in accordance with instructions issued by either of them and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the Awarding Authority to affect the employment of personnel. This provision shall apply only to information pertinent to the Owner's supplementary affirmative action Contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the Awarding Authority and shall set forth what efforts he has made to obtain the information.

### **4. Sanctions**

A. Whenever the Awarding Authority believes the Contractor or any Subcontractor may not be operating in compliance with the terms of this Article, the City of Worcester shall directly, or through its designated agent, conduct an appropriate investigation, and may confer with the parties, to determine if such Contractor is operating in compliance with the terms of this Article. If the City of Worcester finds the Contractor or any Subcontractor not in compliance, it may make a preliminary report on non-compliance, and notify such Contractor in writing of such steps as will in the judgment of the Commission or its agent bring such Contractor into compliance. In the event that such Contractor fails or refuses to fully perform such steps, the City of Worcester **may** make a final report of non-compliance, and recommend the imposition of one or more of the sanctions listed below. If, however, the City of Worcester believes the Contractor or any Subcontractor has taken or is taking every possible measure to achieve compliance, it shall not make a final report of non-compliance. Within fourteen days of the receipt of the recommendations, the Awarding Authority shall move to impose one or more of the following sanctions, as it may deem appropriate to attain full and effective enforcement:

- (1) The recovery by the Awarding Authority from the Contractor of 1/100 of 1% of the Contract award price or \$1,000 whichever sum is greater, in the nature of liquidated

damages or, if a Subcontractor is in non-compliance, the recovery by the Awarding Authority from the Contractor, to be assessed by the Contractor as a back charge against the subcontractor, of 1/10 of 1% of the sub-Contract Price, or \$400 whichever sum is greater, in the nature of liquidated damages, for each week that such party fails or refuses to comply;

- (2) The suspension of any payment or part thereof due under the Contract until such time as the Contractor or any subcontractor is able to demonstrate his compliance with the terms of the Contract;
- (3) The termination, or cancellation, of the Contract, in whole or in part, unless the Contractor or any Subcontractor is able to demonstrate within a specified time his compliance with the terms of the contract;
- (4) The denial to the Contractor or any subcontractor of the right to participate in any future contracts awarded by the Awarding Authority for a period of up to three years.

**B.** If at any time after the imposition of one or more of the above sanctions a Contractor is able to demonstrate that it is in compliance with this Article, the Contractor may request the Awarding Authority to suspend the sanctions conditionally, pending a final determination by the Commission as to whether the Contractor is in compliance. Upon final determination, the Awarding Authority, shall either lift the sanctions or reimpose them.

**C.** Sanctions recommended by the Commission and enumerated under Section A above shall not be imposed by the Awarding Authority except after an adjudicatory proceeding, as that term is used in M.G.L. c. 30A, has been conducted. No investigation by the City of Worcester or its agent shall be initiated without prior notice to the Contractor.

**D.** Notwithstanding the provisions of 4A-4C above, if the Awarding Authority determines after investigation that the Contractor or any Subcontractor is not in compliance with the terms of this Article, it may suspend any payment or portion thereof due under the Contract until the contractor demonstrates to the satisfaction of the Awarding Authority compliance with the terms of this Article. This temporary suspension of payments by the Awarding Authority is separate from the sanctions set forth in Section 4A-4C of this Article above, which are determined by MCAD and recommend to the Awarding Authority. Payment may be suspended only after the Contractor and any other interested party shall have been given the opportunity to present evidence in support of its position at an informal hearing held by the Awarding Authority, and the Awarding Authority has concluded upon review of all the evidence that such penalty is justified. Payment shall not be suspended if the Awarding Authority finds that the Contractor made its best efforts to comply with this Article, or that some other justifiable reason exists for waiving the provisions of this Article in whole or in part.

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## ATTACHMENT A

### **PROCEDURE FOR PRE-ADVERTISING ADJUSTMENT OF MBE/WBE PARTICIPATION GOALS**

#### **A. Affirmative Marketing Participation Goals:**

The combined goals below were established by the Division of Capital Asset Management and Maintenance (DCAMM) and the Supplier Diversity Office (SDO) and require a reasonable representation of both MBE and WBE firms.

**Design Participation:** Combined MBE/WBE goal of (17.9%)  
**Construction Participation:** Combined MBE/WBE goal of (10.4%)

All documentation submitted in connection with MBE/WBE credit must be true, accurate and correct to the best of your knowledge. Your signature on any MBE/WBE goal-related document means that you have read and understand it. Any false claims for MBE/WBE credit are subject to the Massachusetts False Claims Act and any applicable civil or criminal penalties as determined by the Massachusetts Attorney General's office.<sup>1</sup>

#### **B. Criteria for Adjustment of Goals:**

An Awarding Authority may file a written request for the adjustment of participation goals with the Executive Director of the SDO prior to the advertising of the contract.<sup>2</sup> Factors that may be considered include any or all of the following:

- Actual availability of SDO certified Minority-Owned Business Enterprises (MBE) or Women-Owned Business Enterprises (WBE);
- The geographic location of the project;
- The scope of work of the project including the opportunities for sub-contracting and subdividing the work and other relevant factors; and
- The SDO, at the request of the awarding authority or any perspective bidder may agree to assist in MBE/WBE outreach. The SDO is not required nor obligated to do this. It is a complementary service provided, and one the SDO strongly suggests be taken advantage of.

#### **C. Project Thresholds:**

Participation Goals<sup>3</sup> can be adjusted by the Awarding Authority without filing a formal request with SDO if the total estimated construction or design cost is \$100,000 or less.

#### **D. Supporting Documentation for Design and Construction Projects will include, but are not limited to the following:**

1. Documents to support a reduction/waiver request should include a general description of the project, a copy of the detailed project estimates and the deadline for placement of project advertisement;
2. The reasons that the Awarding Authority or its representative is requesting a reduction/waiver of the MBE/WBE participation goals;
3. Documentation that there may be a lack of eligible MBE/WBEs to perform the design or construction contract work after reviewing the SDO Business Directory;
4. Documentation that all subcontracting opportunities were identified and made available to meet the MBE/WBE participation goals;
5. The Awarding Authority may also submit any other information supporting its request for adjustment of the MBE/WBE participation goals; and
6. All applicable sections of the **Massachusetts False Claims Act** as well as any related civil or criminal penalties as determined by the Massachusetts Attorney General are incorporated by reference into this document.<sup>4</sup>

#### **E. Request for Adjustment of Design and Construction Goals:**

1. Requests by an Awarding Authority for Adjustment of MBE/WBE Participation Goals must be submitted in writing no less than ten (10) working days before the deadline for placement of advertisements for the contract. Applications should be directed to the SDO Director of Construction Reform, One Ashburton Place, Room 1017, Boston, MA 02108 or by e-mail to: [John.B.Fitzpatrick@state.ma.us](mailto:John.B.Fitzpatrick@state.ma.us).
2. Requests for adjustments on Design and Construction Goals must be applied for separately and are not interchangeable. Participation credits for modular projects can be awarded under either the design or construction goals, but not both.
3. The written request for the reduction/waiver must include the reasons for it and all supporting documentation.
4. The SDO will provide a written response prior to the advertising deadline.

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<sup>1</sup> See generally, MG.L. c.12, §§5A-5O, inclusive.

<sup>2</sup> In rare instances after advertising and before bidding based on new information you may request an adjustment post-advertisement. Any adjustment granted must be the subject of an Addendum.

<sup>3</sup> For state-assisted building projects.

<sup>4</sup> See generally, MG.L. c.12, §§5A-5O, inclusive.

## ATTACHMENT B

### **PROCEDURES FOR PRE-BID REDUCTION/WAIVER OF MBE/WBE PARTICIPATION GOALS**

#### **A. Affirmative Marketing Participation Goals:**

The combined goals below were established by the Division of Capital Asset Management and Maintenance (DCAMM) and the Supplier Diversity Office (SDO) and require a reasonable representation of both MBE and WBE firms.

**Design Participation:** Combined MBE/WBE goal of (17.9%);  
**Construction Participation:** Combined MBE/WBE goal of (10.4%)

All documentation submitted in connection with MBE/WBE credit must be true, accurate and correct to the best of your knowledge. Your signature on any MBE/WBE goal-related document means that you have read and understand it. Any false claims for MBE/WBE credit are subject to the Massachusetts False Claims Act and any applicable civil or criminal penalties as determined by the Massachusetts Attorney General's office. <sup>1</sup>

#### **B. Criteria for Adjustment of Goals:** <sup>2</sup>

Potential Bidders may request a written adjustment before bids are submitted. An awarding authority cannot grant an adjustment of goals. Only the SDO has the authority to do this. Written requests must demonstrate that there is no feasible way to meet established contract goals and that a "Diligent Good Faith Effort" was made to comply. The request for reduction/waiver will ultimately be decided by the SDO. Factors that may be considered include any or all of the following:

- Actual availability of certified Minority- and/or Women-Owned Business Enterprises (MBE/WBEs);
- The geographic location of the project;
- The scope of work of the project including the opportunities for sub-contracting and subdividing the work;
- Documentation that shows the Bidder attempted in a diligent good faith effort to fulfill contract goals and was unable to do so; and
- Other relevant factors;

Although the SDO is not obligated to do so, the SDO may agree to assist either an awarding authority or any potential bidder with its MBE/WBE outreach. **We strongly encourage you to use this service.**

#### **C. Required Supporting Documentation from Potential Construction Bidders:**

- Using the SDO Reduction/Waiver Request form, the Bidder must prove that notices were sent to certified firms.
- They must break down larger scopes of work into its smallest component parts so that the widest available pool of ready, willing and able certified MBE/WBE firms may participate;
- In the event that an individual scope of work was not made available to ready, willing and able certified firms in certain trade categories,<sup>3</sup> a bidder must explain why in writing. Follow up documentation such as phone logs, or e-mail may be required to determine with certainty whether the firms were interested in performing the work.
- Additional documentation of reasonable efforts on the part of the Bidder to assist a potential MBE/WBE firm may include items such as, but not limited to: (a) bonding, insurance, lines of credit or any other type of assistance; or (b) evidence that the Bidder placed advertisements in appropriate media and trade association publications.
- The Bidder shall also submit any other information reasonably requested by the Awarding Authority.

#### **D. Process for Requesting Waiver/Reduction of Construction Goals:**

Requests from prospective general Bidders to reduce or waive the MBE/WBE participation goals must be written. An awarding authority must receive such requests no later than **ten (10) working days** before the general bids are due. Requests submitted beyond this deadline will not be considered.

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<sup>1</sup> See generally, MG.L.c.12, §§5A-5O, inclusive.

<sup>2</sup> Applies to waivers and reductions.

<sup>3</sup> Other than work performed by filed Sub-Bidders.

**ATTACHMENT C MODEL  
BIDDING INSTRUCTIONS**

**A. Affirmative Marketing Participation Goals:**

Each Municipality must enforce the current Affirmative Marketing Goals developed by the Division of Capital Asset Management and Maintenance (DCAMM) and Supplier Diversity Office (SDO) as follows:<sup>1</sup>

|                                    |   |
|------------------------------------|---|
| <b>Design Participation:</b>       | <b>Combined MBE/WBE goal of (17.9%)</b> |
| <b>Construction Participation:</b> | <b>Combined MBE/WBE goal of (10.4%)</b> |

All documentation submitted in connection with MBE/WBE credit must be true, accurate and correct to the best of your knowledge. Your signature on any MBE/WBE goal-related document means that you have read and understand it. Any false claims for MBE/WBE credit are subject to the Massachusetts False Claims Act and any applicable civil or criminal penalties as determined by the Massachusetts Attorney General's office.<sup>2</sup>

**A. MBE and WBE Participation Requirements:**

1. Compliance with the requirements of this Section is a pre-requisite for receiving a Contract Award. The Contractor must utilize a reasonable representation mix of both MBE and WBE firms whose collective participation either meets or exceeds the overall combined contract goal. Both MBE and WBE firms shall have an opportunity to work on public projects with a combined MBE/WBE goal.
2. Projects with a combined goal must include a reasonable representation of both MBE and WBE firms to meet or exceed the combined goal. Both categories must be reflected in the participation goals, e.g. bidders who meet the participation goals of one category, such as MBE, must still find WBE representation. Combined contract participation goals must be reported and tracked separately.
3. The MBE and WBE participation goals for this Contract are set forth above. The Awarding Authority reserves the right to accept and review written requests but does not have the authority to reduce or waive the MBE or WBE participation goals established for this contract. Waivers or reductions of MBE/WBE participation are contingent on the following: (a) MBE/WBE availability, (b) geographic location, (c) scope of work, (d) the percentage of work available for subcontracting to MBE/WBEs and/or (e) other relevant factors including documentation by General Bidder showing a **Diligent, Good Faith Effort** to secure commitments from MBE/WBE subcontractors. If these criteria are met, the Awarding Authority may submit the General Bidders request along with all the foregoing documentation to the Executive Director of the Supplier Diversity Office (SDO) for final determination.
4. All contracts shall provide MBE/WBE firms with contracting opportunities. If a bidder fails to make a subcontracting opportunity available to certified MBEs/WBEs, it must explain why in writing. The Bidder shall also demonstrate that, where commercially reasonable, subcontracts were divided into smaller scopes or tasks capable of being performed by MBE/WBEs.
5. A successful bidder must provide notice of: (a) each MBE/WBE solicited, and (b) each MBE/WBE listed in the SDO directory under the applicable trade category that was not solicited and reasons therefore. The Bidder shall also state the date that notices were mailed and provide a copy of the written notice(s) sent.
6. Reasonable follow up efforts include written notices sent to MBE/WBEs with telephone calls or personal visits in order to determine with certainty whether the MBE/WBEs were interested in performing the work. Phone logs or other documentation must be submitted.
7. A statement of the response received from each MBE/WBE solicited, including the reason for rejecting any MBE/WBE who submitted a bid or proposal may also be provided
8. If MBE/WBEs have difficulty obtaining bonding, insurance or lines of credit to participate in the project, prospective bidders must show reasonable efforts were made to assist MBE/WBEs to obtain bonding, insurance, or lines of credit.
9. Reasonable efforts may also include whether a Bidder placed advertisements in appropriate media and trade association publications announcing the Bidder's interest in obtaining bids or proposals from MBE/WBEs, and/or sent written notification to MBE/WBE economic development assistance agencies, trade groups and other organizations notifying them of the Contract and the work to be subcontracted by the Bidder to MBE/WBEs. The Bidder shall also submit any other information reasonably requested by the Awarding Authority to show that the Bidder has taken all possible reasonable steps to achieve the MBE/WBE participation goals.
10. If **filed Sub-Bids** are solicited for this Contract, requests to reduce or waive the MBE/WBE participation goals must be received by the Awarding Authority no later than ten (10) working days after the list of filed Sub-Bidders is sent by the Awarding Authority to persons who have taken out plans for the Contract. If there are no filed Sub-Bids solicited for this Contract, requests to reduce or waive the MBE/WBE participation goals for this Contract must be received by the Awarding Authority no later than ten (10) working days before the date set for the receipt of general Bids. **The Awarding Authority Will Not Consider Any Request To Reduce Or Waive The MBE/WBE Participation Goals For This Contract That Is Received After These Deadlines.**
11. Within five (5) working days after the opening of general Bids, the low Bidder shall submit the following documents to the Awarding Authority's Affirmative Marketing Construction Officer (AMCO): (a) a completed Schedule for Participation by MBE/WBE ("Schedule for Participation") in the form provided by the Awarding Authority showing MBE/WBE participation in amounts equal to or exceeding the MBE/WBE participation goals for this Contract, (b) a completed Letter of Intent in the form provided by the Awarding Authority for each MBE/WBE listed in the Schedule for Participation, and (c) the most recent SDO

<sup>1</sup> Periodically, goals may be changed or adjusted. Check the [SDO web site](#) for current MBE/WBE participation goals.

<sup>2</sup> See generally, MG.L. c.12, §§5A-5O, inclusive.

certification letter for each MBE/WBE listed in the Schedule of MBE/WBE Participation showing that the MBE/WBE is certified in the area of work for which it is listed on the Letter of Intent.

12. Each Letter of Intent shall describe the work to be performed by the MBE/WBE (the “ MBE/WBE ”) with enough specificity to allow an awarding authority to determine which specific items count for MBE/WBE participation credit. The Awarding Authority reserves the right to reject any Letter of Intent if the price to be paid for the MBE/WBE Work does not bear a reasonable relationship to the value of such work under the Contract.
13. Within five (5) working days after receipt of the Schedule for MBE/WBE Participation, Letters of Intent, and most recent SDO certification letter, the Awarding Authority shall review and either approve or disapprove the apparent low Bidder's submissions. If the apparent low Bidder has not submitted an appropriate Schedule for MBE/WBE Participation and appropriate Letters of Intent and SDO most recent certification letter establishing that the MBE/WBE participation goal for the project will be met, the apparent low Bidder will be considered ineligible for Award of the Contract and the Awarding Authority will Award the Contract to the second lowest eligible and responsible Bidder, subject to said Bidder's compliance with these conditions. If funds are insufficient to award to the second lowest Bidder, the project may have to be re-bid.
14. General Conditions of the Contract require the Contractor to submit, within thirty (30) days of the Contract Date, copies of current certification letters for all subcontractors, signed subcontracts with all subcontractors or a purchase order or invoice from each material supplier and/or manufacturer listed on the Schedule for MBE/WBE Participation.
15. A filed sub-Bidder is not required to submit a Schedule of MBE/WBE Participation with its Bid. It may submit a Letter of Intent with its Bid if it is a SDO certified MBE/ WBE. If a filed sub-Bidder intends to sub-subcontract work to a SDO certified MBE/WBE, and the awarding authority permits limited sub-sub-contracting for purposes of MBE/WBE participation, and the filed sub-Bidder wishes that sub-subcontract to be credited toward the participation goals for this Contract, the filed sub-Bidder should submit a Letter of Intent from that MBE/WBE with its Bid.



**ATTACHMENT D     MODEL**  
**CONTRACT INSTRUCTIONS FOR**  
**MUNICIPAL CONTRACTS AND STATE ASSISTED BUILDING PROJECTS**

**A. Affirmative Marketing Participation Goals:**

The combined goals below were established by the Division of Capital Asset Management and Maintenance (DCAMM) and the Supplier Diversity Office (SDO) and require a reasonable representation of both MBE and WBE firms:

|                                    |   |
|------------------------------------|---|
| <b>Design Participation:</b>       | <b>Combined MBE/WBE goal of (17.9%)</b> |
| <b>Construction Participation:</b> | <b>Combined MBE/WBE goal of (10.4%)</b> |

All documentation submitted in connection with MBE/WBE credit must be true, accurate and correct to the best of your knowledge. Your signature on any MBE/WBE goal-related document means that you have read and understand it. Any false claims for MBE/WBE credit are subject to the Massachusetts False Claims Act and any applicable civil or criminal penalties as determined by the Massachusetts Attorney General's Office.<sup>1</sup>

**B. MBE/WBE Participation Credit:**

1. MBE and WBE participation goals are not interchangeable.
2. Participation credit is only given for actual contract work performed by currently certified MBE, WBE or M/WBE firm.
3. If the firm awarded the contract is itself currently certified as a MBE/WBE, 100% participation credit will be given for the work performed.
4. If the prime contractor is not a certified firm, it shall only receive credit for the portion of work completed by the certified firm.
5. MBE/WBE participation credit will be given to a supplier **only** if they are regularly engaged in sales of equipment or supplies to the construction industry from an established place of businesses and bear the risk of loss for product sold prior to delivery to a customer.
6. A contractor can count only 10% of the contract price towards an MBE or WBE goal on DCAMM projects.

**C. Establishing MBE/WBE Status:**

1. A business will be eligible for participation credit only if it has been certified by the Supplier Diversity Office (SDO) as a minority business enterprise (MBE) or a woman business enterprise (WBE).
2. Certification as a MBE/WBE **by any other agency other than SDO does not** confer the status to the firm for the purposes of contract participation credit.
3. Participation credit shall only be given to firms which are certified at the time of contract award
4. A firm currently being initially reviewed as part of the certification process cannot be used by a contractor towards MBE/WBE participation credit.

**D. Performance of Contract Work by MBE/WBEs:**

1. Only currently certified MBE/WBE firms count towards participation goals. If during the course of a contract, a SDO certified MBE/WBE firm is decertified their participation credit will be counted up until the date of decertification
2. An awarding authority will not grant MBE/WBE participation credit unless the contract work is actually completed by a certified SDO MBE/WBE firm. No credit will be given for work done by others or for work not on a MBE/WBE schedule of participation.
3. Once a letter of intent and a MBE/WBE letter of participation are approved, a contractor may not perform this same work using its own staff without the prior express written prior approval of the Awarding Authority.
4. The Contractor shall monitor the performance of MBE/WBE Work to ensure that each scheduled MBE/WBE performs its own work with its own workforce.

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<sup>1</sup> See generally, MG.L. c. 12, §§5A-5O, inclusive.

5. The Contractor and each MBE/WBE subcontractor shall provide the Awarding Authority with all information and documentation necessary to ascertain whether or not an MBE/WBE has performed its own MBE/WBE Work with its own personnel, tools and equipment.
6. Failure to submit documentation to the Awarding Authority shall establish conclusively for the purpose of giving MBE/WBE participation credit under this Contract that such MBE/WBE did not perform such work.

**E. Notification of Changes in MBE/WBE Work:**

If during the performance of a contract, a contractor determines or has reason to believe that:

1. A scheduled MBE/WBE is unable or unwilling to perform its MBE/WBE Work;
2. There has been or will be a change in any MBE/WBE Work; or
3. That the Contractor will be unable to meet the MBE/WBE participation goal(s) for the Contract for any reason.

Then he/she shall immediately notify the Awarding Authority in writing. Any notice of a change in MBE/WBE Work shall include a revised Schedule of MBE/WBE Participation, and additional or amended Letters of Intent and related subcontracts, as needed.

**F. Good Faith Efforts Needed to Support Changes/Reduction of MBE/WBE Participation Goals:**

If there is a change or reduction in any MBE/WBE Work which will result in the Contractor failing to meet the MBE/WBE participation goal(s), then he/she shall undertake a diligent, good faith effort to make up the shortfall as follows:

1. The Contractor shall identify all items of the Work remaining to be performed under the Contract that they made available for subcontracting to MBE/WBEs along with that which wasn't along with reasons why.
2. The Contractor shall send written notices to all MBE/WBEs ready, willing and able to perform such work. The contractor will provide the Awarding Authority with documentation identifying: (i) each MBE/WBE solicited, and (ii) each MBE/WBE listed in the SDO directory under the applicable trade category that was not solicited and the reasons why. The Contractor shall also advise the Awarding Authority of the dates that notices were sent and provide a copy of the written notice(s) sent.
3. The Contractor shall make reasonable efforts to follow up on the written notices, including telephone calls or personal visits in order to determine with certainty whether the MBE/WBEs were interested in performing the work. Phone logs or other documentation must be submitted to the Awarding Authority upon request.
4. The Contractor shall make documented reasonable efforts to assist MBE/WBEs that need assistance in obtaining insurance, bonds, or lines of credit in order to perform work under the Contract. Supporting documentation will be provided to the Awarding Authority upon request.
5. The Contractor shall provide the Awarding Authority with a statement of the response received from each MBE/WBE solicited, including the reason for rejecting any MBE/WBE who submitted a proposal.
6. The Contractor shall take any additional measures including, without limitation, placing advertisements in appropriate media and trade association publications announcing the Contractor's interest in obtaining proposals from MBE/WBEs, and/or sending written notification to MBE/WBE economic development assistance agencies, trade groups and other organizations notifying them of the project and of the work available to be subcontracted by the Contractor to MBE/WBEs.

If the Contractor is unable to meet the MBE/WBE participation goals for this Contract after complying fully with each of the above requirements and is otherwise in full compliance with the terms of this provision, the Awarding Authority may reduce the MBE/WBE participation goals for this Contract to the extent that such goals cannot be achieved.

**G. Suspension of Payment and/or Performance for Noncompliance:**

If a reduction of MBE/WBE goals was given but sufficient good faith efforts (see above) were not documented, then after proper written notice, the Awarding Authority has the discretion to:

1. Suspend payment to the Contractor of an amount equal to the value of the work which was to have been performed by an MBE/WBE pursuant to the Contractor's Schedule of MBE/WBE Participation but which was not so performed, in order to ensure that sufficient Contract funds will be available if liquidated damages are assessed;
2. Suspend the Contractor's performance of this Contract in whole or in part.

Notice Required Prior to Suspension: The Awarding Authority shall give the Contractor prompt written notice of any action taken and shall give the Contractor and any other interested party, including any MBE/WBEs, an opportunity to present evidence to it that the Contractor is in compliance with the requirements, or that there is some justifiable reason for waiving the requirements in whole or in part. The Awarding Authority may invite SDO to participate in these proceedings

If, based on a totality of the circumstances, it can be shown that all reasonable steps were taken and that the Contractor is in full compliance with the requirements of this Attachment, or that the Contractor has met or will meet the MBE/WBE participation goals for this Contract, the Awarding Authority shall release any funds withheld and lift any related suspension of the Contractor's performance.

#### **H. Liquidated Damages; Termination**

If payment by the Awarding Authority or performance by the Contractor is suspended, and if the breach cannot be cured or that same contractor fails to take all reasonable and immediate efforts to comply with the MBE/WBE participation goals set forth in this Contract, subject to the notice provisions above:

1. The Awarding Authority may terminate this Contract; or
2. The Awarding Authority may retain from final payment to the Contractor, as liquidated damages, an amount equal to the difference between:
  - a. The total of the MBE/WBE participation goals set forth in this Contract, and;
  - b. The amount of MBE/WBE participation credit earned by the Contractor for MBE/WBE Work performed under this Contract minus the cost to restore the loss to the Awarding Authority.
3. Any liquidated damages will be assessed separately for MBE and WBE participation.

Discretionary Option to Review Any Additional Mitigating Evidence Prior to Final Decision: Before exercising its rights and remedies, the Awarding Authority may but is not required to give the Contractor and any other interested party a final opportunity to present evidence that the Contractor is in compliance with the requirements or that there is some justifiable reason for waiving the requirements of this Attachment in whole or in part. The Awarding Authority may invite SDO to participate in these proceedings.

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OPERATIONAL SERVICES  
DIVISION

SUPPLIER DIVERSITY OFFICE

Reginald Nunnally  
Executive Director

THE COMMONWEALTH OF MASSACHUSETTS  
Executive Office for Administration and Finance

OPERATIONAL SERVICES DIVISION

One Ashburton Place, Suite 1017  
Boston, MA 02108—1552

Charles D. Baker  
Governor

Karyn E. Polito  
Lieutenant Governor

Kristen Lepore  
Secretary

Gary J. Lambert  
Assistant Secretary for  
Operational Services

SUPPLIER DIVERSITY OFFICE  
CONSTRUCTION REFORM PROGRAM  
MUNICIPALITIES GENERAL GUIDELINES

The Supplier Diversity Office (SDO) issues the Construction Reform Program guidelines on the [Municipality Guidelines](#) webpage in accordance with the statutory standards set forth in [Chapter 193 of the Acts of 2004](#), which includes a municipal affirmative marketing program for currently certified firms in the Commonwealth of Massachusetts.

THE BIDDING AND CONTRACT INSTRUCTIONS ON THE [MUNICIPALITY GUIDELINES](#) WEBPAGE MUST BE INCORPORATED INTO CONTRACT DOCUMENTS, AS REQUIRED BY CHAPTER 193 OF THE ACTS OF 2004.

Municipalities must incorporate Minority Business Enterprise (MBE) and Women Business Enterprise (WBE) goals into both their design and construction procurement for municipal contracts for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building by any city or town that includes funding provided by the Commonwealth such as legislative appropriations, grant awards, reimbursements and municipal commitments to use state funds.

Only firms which are currently MBE or WBE certified by the Supplier Diversity Office (SDO) at the date of contract award will be counted for Construction Reform program purposes. The firm's current SDO state certification letter shall serve as the sole and exclusive proof of state certification.

Certification as a Disadvantaged Business Enterprise (DBE), certification as an MBE/WBE by any agency other than SDO, or submission of an application to SDO for certification as an MBE/WBE shall not confer MBE or WBE status on a firm for purposes of construction reform program participation credit.

**Affirmative Marketing Participation Goals:**

The combined goals below were established by the Division of Capital Asset Management and Maintenance (DCAMM) and the Supplier Diversity Office (SDO) and require a reasonable representation of both MBE and WBE firms:

|                             |                                   |
|-----------------------------|-----------------------------------|
| Design Participation:       | Combined MBE/WBE goal of (17.9%)  |
| Construction Participation: | Combined MBE/WBE goal of (10.4%)» |

Documentation submitted with your signature means that you swear under the pains and penalties of perjury that you have read and understand it. Any false claims for MBE/WBE credit are subject to the Massachusetts False Claims Act and any applicable civil or criminal penalties as determined by the Massachusetts Attorney General's office.'

**Questions and Contact Information:**

Separate and individual PDF files are attached for your reference. All questions concerning the Construction Reform Act and the implementation of the new law may be directed to the SDO Director of Construction Reform at 617-502-8851 or by e-mail at [John.B.Fitzpatrick@state.ma.us](mailto:John.B.Fitzpatrick@state.ma.us)

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See generally, M.G.L. c.12, §§5A-5O, inclusive.

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## APPENDIX C

### PROCEDURES FOR AWARD OF SUBCONTRACTS

Pursuant to M.G.L. c.149A, as contained in Chapter 193 of the Acts of 2004, the City of Worcester is required to develop a process consistent with legal requirements for the selection of subcontractors for construction manager at risk projects. This process is described in these Procedures for Award of Subcontracts (the “Procedures”). The Procedures are divided into three parts. The first part describes the prequalification and procurement of “Trade Contractors”, which, for the purposes of the Procedures, shall mean the subcontractors performing work in trade categories covered by Section 44F of Chapter 149. The second part describes the prequalification and procurement of all subcontractors that are not Trade Contractors. The third part addresses additional procurement matters.

For the purposes of the Procedures, the term Project shall mean the specific construction project to which the Procedures are being applied; the term CM shall mean the construction manager at risk selected by the City of Worcester to construct the Project; the term Designer shall mean the firm (and its subconsultants) selected by the City of Worcester to design; the term Project Manager shall refer to the City of Worcester staff serving as Project Manager on the project; and the term Applicant shall mean any firm that submits a response pursuant to the Procedures.

#### I. TRADE CONTRACTORS

##### A. Applicability of Procedures

1. Subcontracts Subject to Trade Contract Procedures. The procedures set forth in Sections 2 and 3 below shall govern the award of subcontracts by the CM for the furnishing of labor, materials, and equipment in the performance of the categories of work listed below whenever the estimated construction cost of such category of work exceeds \$20,000:

|   |   |
|---|---|
| Roofing and Flashing                      | Glass and Glazing   |
| Metal windows                             | Painting  |
| Waterproofing, Damp-proofing and Caulking | Plumbing  |
| Miscellaneous and Ornamental Iron         | Heating, Ventilating, and Air Conditioning                |
| Lathing and Plastering;                   | Electrical work   |
| Acoustical Tile                           | Elevators   |
| Marble                                    | Masonry work  |
| Tile                                      |   |
| Terrazzo                                  | Any other categories of work selected by the              |
| Resilient Floors                          | City of Worcester for designation as Trade Contract work. |

The subcontractors performing these trades are referred to throughout the Contract Documents as “Trade Contractor(s).” Contracts for work in these categories of work where the estimated cost of such work exceeds \$20,000 are referred to as “trade contracts.”

##### B. Qualification of Trade Contractors

1. Prequalification Committee. DCAM shall establish a prequalification committee (“the Prequalification Committee”) consisting of four members. The members shall include two employees of the city’s DPW&P with management roles in the construction of large buildings, a representative of the Designer, and a

representative of the CM. The Commissioner of DPW&P shall designate the Chairperson of the Prequalification Committee. An alternate may be appointed for each member of the Prequalification Committee to serve on occasions when the regular member cannot be available. Both the representative of the Designer and CM serving on the Prequalification Committee, and the alternates representing the Designer and CM shall be subject to the City of Worcester's approval. The Prequalification Committee shall conduct the prequalification of trade contractors as set forth in Sections 2 and 3 of the Procedures. The CM will provide assistance to the Prequalification Committee in the exercise of its responsibilities under the Procedures, including assistance from CM staff.

Three members of the Prequalification Committee shall constitute a quorum for the purposes of conducting the Prequalification Committee's official business. The Commissioner or his designee may join any meeting of the Prequalification Committee as a voting member in order to achieve a quorum, if in the Commissioner's judgment the action scheduled for such meeting cannot be postponed without adverse consequences to the Project.

Request for Qualifications. The City of Worcester shall issue a request for qualifications ("RFQ") for each category of work listed in Section 1.1 if such work is required on the Project. The RFQ shall be placed on the Comm-PASS web site; advertised in a newspaper of general circulation in the area of the Project and in the *Central Register* established under Massachusetts General Laws, Chapter 9, Section 20, and in such additional media as DCAM and the Prequalification Committee may deem appropriate at least fourteen (14) calendar days before the deadline for Applicants to submit a response to the RFQ by submission of a Statement of Qualifications ("SOQ"). All interested Trade Contractors shall be eligible to respond to the RFQ and participate in the prequalification process. The CM firm may submit its qualifications to bid on trade contract work provided that the CM customarily performs the work for which it submits its qualifications and does so with employees on its own payroll, and provided that the CM meets all the requirements of the selection process. The RFQ shall be prepared by the City of Worcester in a form consistent with the requirements of M.G.L. c. 149A and in consultation with the Prequalification Committee and the CM. The RFQ shall contain a form or forms (individually or collectively, the City of Worcester "Statement of Qualifications" or "SOQ") requiring the information necessary for the Prequalification Committee to determine if the Applicant is qualified to perform the category of work for which it seeks prequalification on the Project. City of Worcester's Standard form RFQ and SOQ will be provided by the City of Worcester and must be utilized as the RFQ and SOQ for the Project. The RFQ shall include, at a minimum:

- a. the date, time, and place for submission;
- b. relevant information about the project and the bidding process;
- c. the specific criteria for trade contractor prequalification and selection;
- d. a statement indicating that the RFQ will be used to prequalify trade contractors that will be invited to submit a bid; and
- e. that the responders' names are to be posted, but that there shall be no public opening of responses.

Prequalification Criteria. The Prequalification Committee shall evaluate the information submitted by each Applicant on its the City of Worcester Statement of



Qualifications, the results of reference checks performed by the City of Worcester and/or the CM, and any other information required or obtained by the Prequalification Committee. The following subparagraphs enumerate the legally required categories to be used by the Prequalification Committee in evaluating the Applicants, the subcategories of information within each category, and the specific point allocation required for prequalification within each category. Applicants must achieve an overall score of 70 or greater and must also achieve the minimum required points within each category in order to be deemed prequalified. Applicants that do not achieve both the minimum scores within each category and do not achieve an overall score of 70 or above shall not be deemed prequalified.

- a. Management Experience (50 points; minimum of 25 required for approval)
  - i) Business owners - The name, title, years with firm of the owner(s) of the business (1 Point)
  - ii) Management personnel - The names, title, education and construction experience, years with firm, and list of projects completed by all management personnel. (25 Points)
  - iii) Similar project experience - The project name(s), description, description of scope, original trade contract sum, final trade contract sum with explanation, and date completed of similar projects. (10 Points)
  - iv) Terminations – A list of any projects on which the trade contractor was terminated or failed to complete the work. (3 Points)
  - v) Lawsuits – A list of commercial lawsuits in which the trade contractor is a defendant or defendant-in-counterclaim with regard to construction contracts within the last 3 years. The lawsuits shall not include any actions that primarily involve personal injury or workers' compensation claims, or where the sole cause of action involves the trade contractor's exercise of its rights for direct payment under the law. (3 Points)
  - vi) Safety record – The three-year history of the trade contractor's workers' compensation experience modifier. (8 Points)
- b. References (30 points; minimum of 15 required for approval)
  - i) Client references - for all projects listed in clause (iii) of Management experience above, including the project name, client's name, address, telephone and fax number, and contact person. (24 Points)
  - ii) Credit references - .A minimum of five credit references, including telephone and fax number of contact person from key suppliers, vendors and banks. (3 Points)
  - iii) Public project record – A list of all completed public building construction projects as defined in section 44A of chapter 149 during the past three years with client's name, address, telephone and fax number and contact person. (3 Points)
- c. Capacity to Complete Projects – (20 points; minimum of 10 required for approval)
  - i) Annual revenue for prior three fiscal years. There shall be no requirement for submission of financial statements. (10 Points)
  - ii) Revenue under contract for next three fiscal years. (10 Points)
- d. Commitment Letter – (mandatory no points assigned)

Mandatory commitment letters from surety companies or authorized agents stating that payment and performance bonds at 110% of the estimated trade contract value will be provided to the applicant if it is the successful bidder. The surety company providing the commitment letter must be licensed to do business in the Commonwealth and appear on the United States Treasury Department Circular 570.

e. Certificate of Eligibility – (mandatory, no points assigned)

All SOQs submitted after January 1, 2006 must include a DCAM issued certificate of eligibility listing the Applicant as currently certified as a subcontractor in the scope of work for which the Applicant is submitting its SOQ.

f. Update Statement – (mandatory, no points assigned)

All SOQs submitted after January 1, 2006 must include a fully completed and current Update Statement prepared by the Applicant.

Applicants that are certified by the Massachusetts State Office of Minority and Women Business Enterprise (“SOMWBA”) as either a Minority Business Enterprise, a Women Business Enterprise or a Minority/Women Business Enterprise and provide documentation of current SOMWBA certification with their SOQ will have an additional 5 points added to their overall score.

If the Applicant is a joint venture, the Applicant must submit a copy of the joint venture agreement, signed by each member, and the joint venture agreement must clearly identify, for each member of the joint venture, such member’s proportionate share or interest in the financial or other benefits, risks or liabilities of the venture (“joint venture interest”). One member of the joint venture must have a joint venture interest greater than fifty (50) percent (“the Lead Venturer”). The requirements for prequalification in 2.3 a-f above shall be met by each member of the joint venture; and the bonding requirements of 2.3 d above shall be met by the Lead Venturer or by the joint venture as an entity. A joint venture prequalified by the Prequalification Committee must obtain a Certificate of Eligibility from the City of Worcester prior to the time bids are filed and must submit the Joint Venture’s Certificate of Eligibility with its bid.

Joint ventures must be submitted for consideration by the Prequalification Committee.

Following the deadline for submission of SOQs for a specific category of work, joint ventures for that category of work which were not submitted to the Prequalification Committee may not bid on that category of work, except that two firms both of whom were independently prequalified by the Prequalification Committee for that category of work, may form a joint venture to bid that category of work without further consideration by the Prequalification Committee provided the Joint Venture has been the City of Worcester Certified prior to submitting its bid and submits the Joint Venture’s Certificate of Eligibility with its bid.

Deliberations of the Prequalification Committee. The Prequalification Committee shall consider each SOQ submitted based on the criteria set forth in Paragraph 2.3 above.

The Prequalification Committee shall require that all mandatory submissions are submitted by the Applicant and apply a numerical scoring system, with both the minimum point scores for each category, and a score of 70 out of a possible 100 overall points, required to be prequalified. The Prequalification Committee shall prepare a written record of the evaluation of each Applicant.

The scoring system shall provide for the assigning of scores as follows. The Prequalification Committee shall first consider whether the Applicant has met the requirements of Subparagraphs d, e and f, bonding commitment letter, certificate of

eligibility and update statement. If the Applicant has satisfied those criterion, it shall be awarded up to 100 points using the criteria listed above. Applicants that do not meet the requirements of Subparagraphs d, e and f shall not be presented to the Prequalification Committee for consideration.

Any Applicant that fails to achieve either an overall score of at least 70 or that fails to achieve the minimum required points within each category shall be deemed not to be prequalified for the category of work for which the Applicant sought prequalification. If it is determined at any time during the evaluation process, that an Applicant has willfully supplied materially false or misleading information in its application or otherwise, the Applicant may be eliminated from further consideration for prequalification for the Project and, in the discretion of the Commissioner, for any other projects requiring prequalification under these Procedures.

The decision of the Prequalification Committee shall be final and not subject to appeal except on the grounds of fraud or collusion. An Applicant firm's prequalification score shall be made available to that Applicant firm only and only upon request. An Applicant firm's score shall not be a public record as defined in M.G.L. c. 4, §7 and shall not be open to public inspection to the fullest extent possible under the law.

A list of the Applicants that have been determined by the Prequalification Committee to be prequalified and therefore eligible to bid shall be posted at the offices of the City of Worcester listing the firms by trade categories. Applicants shall also be notified of the Prequalification Committee's determination on prequalification by mail at the address furnished by each Applicant.

The Prequalification Committee reserves the right to reopen the prequalification process for any category of work before it has completed its evaluation of firms that previously submitted City of Worcester's SOQs and/or to hold multiple rounds of prequalification for any given category of work. In either case, any Applicant that has submitted a complete City of Worcester SOQ shall not be required to submit another one, although any Applicant not prequalified may elect to amend its SOQ prior to the latest deadline for submitting information for the trade contract for which the Applicant seeks to be prequalified.

No person or firm suspended or debarred pursuant to Massachusetts General Laws Chapter 29, Section 29F, or Chapter 149, Section 44C, or disqualified pursuant to Chapter 7, Section 38D, or which has been debarred by the Federal Government shall be determined to be qualified to compete for a trade contract or any other contract or subcontract to be issued on the Project. If any Applicant determined to be qualified to perform one or more trade contracts is subsequently suspended or debarred pursuant to such laws, the qualification of such Applicant shall be rescinded and such Applicant shall be notified of such action and eliminated from the list of prequalified bidders.

Determinations to Remain in Effect. The Prequalification Committee's determinations as to which Applicants are prequalified shall remain in effect, subject to the following provisions of this Section 2.5, for the duration of the Project. Upon receipt at any time of additional information deemed material and significant by the Prequalification Committee regarding a previously prequalified Applicant's qualifications or responsibility, including, but not limited to, compliance with any minimum prequalification requirements, the Prequalification Committee may determine, in consultation with the City of Worcester and the CM, that the Applicant is not

qualified to perform the applicable trade contract(s) for the Project. In such event, the Prequalification Committee shall notify the Applicant of its determination, and inform the Applicant of any information on which the Prequalification Committee's determination is based that was not furnished by the Applicant.

**C. Bidding**

1. Requests for Bids. A request for bids ("RFB") will be issued for each trade contract subject to Sections 2 and 3 of these Procedures. The RFB will only be issued to the Trade Contractors appearing on the list of prequalified Applicants for the applicable trade contract determined pursuant to Section 2 above. The RFB shall include at least the following attachments:
  - a. the date, time and place for submission of responses to the request for bids. All Trade Contractor bids for DCAM projects will be submitted and opened at the architectural offices of DPW&P at 50 Skyline Drive, Worcester, MA 01605.;
  - b. fully detailed drawings and specifications by class of work in accordance with paragraph (a) of Subsection 1 of Section 44F of Chapter 149 of the Massachusetts General Laws (i.e., separate specification sections for the trades listed in Paragraph 1.1 above) which shall provide for full competition for each item of material to be furnished under the contract as set forth under subsection (b) of M.G.L. c.30, §39M;
  - c. drawings and specifications that provide for full competition for each item of material to be furnished under the contract as set forth under Subsection (b) of Section 39M of Chapter 30 of the Massachusetts General Laws;
  - d. a detailed definition of the Trade Contractor's scope of work, including alternates and unit price items, if any, within that scope of work;
  - e. a project schedule indicating the planned sequence and duration of each trade contractor's work;
  - f. list of the Trade Contractors prequalified for the work covered by the RFB;
  - g. a Trade Contractor bid form, in a format provided by the City of Worcester, that shall require, without limitation, a listing of price, addenda, alternates and unit price items, if any, for the trade work; certification that the trade contractor will perform the complete trade work with employees on his own payroll, except for work customarily performed by sub-trade subcontractors within the trade; and the names of all sub-trade subcontractors to be used if awarded the trade contract and each sub-trade contract sum; to the extent applicable, an identification by the Trade Contractor that it is a MBE or WBE or a list of the MBEs and/or WBEs proposed to be used by the Trade Contractor;
  - h. an affidavit that must be executed by all bidders confirming that all sub-trade subcontractors named on the bid form have been prequalified by the Trade Contractor using criteria similar to the criteria for the prequalification of Trade Contractors;
  - i. an affidavit of tax compliance that must be executed by all bidders;
  - j. an affidavit of prevailing wage compliance pursuant to M.G.L. c. 149, §§ 26 and 27 that must be executed by all bidders;

- k. a noncollusion affidavit that must be executed by all bidders;
  - l. a requirement that a bidder post a 5% bid bond from a surety company licensed to do business in the Commonwealth and whose names appears on U.S. Treasury Department Circular 570; but the bid bond shall be returned to the bidder if the bidder is not selected as the Trade Contractor;
  - m. a budget for the project, and the budget amount for the trade contract scope of work as provided in the project guaranteed maximum price, if available, or as provided in the most recent budget for the project;
  - n. a requirement that a bidder submit a current Certificate of Eligibility issued by the City of Worcester to the Trade Contractor showing that the Trade Contractor is certified for the trade category for which the bid is submitted.
  - o. a requirement that a bidder submit a completed Update Statement with its bid; and
  - p. a Trade Contractor agreement form as set forth in M.G.L. c. 149A, §8 (k).
- The prequalified Trade Contractors shall submit bids in compliance with the requirements of the Request for Bids package.

2. 2. Bid Opening, Award, Rejection and Negotiation of Bids. Bids shall be opened publicly by the City of Worcester. Bids for each trade shall be: a) accepted only from firms appearing on the list of prequalified firms described in Paragraph 2.4 for such trade; b) submitted as set forth in the RFB, and c) opened publicly. Any bid which does not include the bid bond or affidavits required pursuant to law or any response in which the information requested is incomplete, conditional, or obscure or which contains any additions not required in the request for bids package shall be rejected. The trade contract for each trade shall be awarded to the lowest prequalified bidder except that the City of Worcester reserves the right to reject the bids of any and all Trade Contractors if: a Trade Contractor is not eligible to submit a bid; if the bid does not represent the bid of a person competent to perform the work specified; or if less than three such bids were received and the prices are not reasonable for acceptance without further negotiation or competition. In addition if fewer than three responsive bids are received for any trade category and the lowest bid exceeds the estimated cost for the work, the CM shall attempt to negotiate an acceptable price with the lowest prequalified bidder. If the negotiations are unsuccessful, the construction manager shall terminate negotiations with the lowest prequalified bidder and shall initiate negotiations with the trade contractor who was the second lowest prequalified bidder. If the CM is unsuccessful in negotiating an acceptable price with the lowest prequalified bidder and second lowest prequalified bidder, the construction manager, on behalf of and with the consent of the public agency, shall solicit additional bids utilizing the procedures for selection of subcontractors who are not trade contractors, set out below and in M.G.L. c. 149A, § 8 (j).
3. 3. Trade Contract Execution. Each trade contractor selected to perform work on the Project shall return an executed trade contract

including the required performance and payment bonds and insurance certificate to the CM within 10 business days of receipt of the trade contract from the CM. The trade contract shall be the trade contract agreement required by law and in a form provided by the City of Worcester.

## **II. OTHER SUBCONTRACTS**

### **A. Applicability of Procedures**

1. Subcontracts Subject to Procedures For Other Subcontracts. The process set forth in these Sections 4 and 5 of the Procedures shall apply to the procurement of subcontracts and subcontractors that are not subject to the provisions of Sections 2 and 3 above, specifically subcontractors that are not Trade Contractors, and where the subcontract scope of work has an estimated value that is equal to or exceeds \$20,000.

### **B. Prequalification and Procurement**

1. Subcontracts in With An Estimate Cost equal to or greater than \$20,000. For Subcontracts that are not trade contracts with an estimated cost equal to or greater than \$20,000, the CM shall submit to the City of Worcester for its approval the qualifications which it believes a subcontractor must have to perform the work of the subcontract and a list of a minimum of three (3) subcontracting firms, and preferably at least five (5) subcontracting firms, which the CM believes meet the qualifications. The CM shall submit information in a form and content satisfactory to the City of Worcester concerning the qualifications and responsibility of the proposed subcontractors and, when relevant, how the selection will further the CM's compliance with its Project MBE and WBE participation goals. The CM firm may submit its qualifications to bid on subcontract work provided that the CM customarily performs the work for which it submits its qualifications and does so with employees on its own payroll, and provided that the CM meets all the requirements of the selection process. The City of Worcester may eliminate firms from the list of firms submitted by the CM, and the City of Worcester may add firms to the list submitted by the CM. The CM must add the firms requested by the City of Worcester to the list if the firms are acceptable to the CM. If the firms the City of Worcester requested be added are not acceptable to the CM based upon qualifications, ability or for any other reason the CM must advise the City of Worcester of its objections and the basis for the objections in writing. If the City of Worcester determines that the CM's objections to the City of Worcester requested firm(s) are valid then the requested firms will not be added to the list otherwise the firm(s) requested by the City of Worcester will be added.

The CM will invite all subcontractors on the approved list to submit bids for the subcontract work, using forms and procedures approved by the City of Worcester. The bids shall be based on detailed bidding information developed by the CM for the subcontract work. The CM will submit to the City of Worcester a list of bids submitted for each subcontract and with the list will indicate the bidder it recommends be selected to be awarded a subcontract. The CM shall along with its submission provide a written explanation as to the reasons for its selection and recommendation. The CM's recommendation

will be based on relevant factors including, but not limited to, price, quality of work, and MBE and/or WBE participation. City of Worcester's approval is required before a subcontract can be awarded by the CM to a subcontractor, which approval shall not be unreasonably withheld provided the selection will not have an adverse effect on meeting project goals including, but not limited to, price, quality of work and/or MBE/WBE participation. In no event will the selection of a subcontractor affect the GMP agreed to by the CM.

The CM may, with the approval of the City of Worcester, reject the proposals for a subcontract and either resolicit that scope of work or negotiate with one or more of the firms that submitted the rejected proposals. Such rejection may be based on the proposal being too high compared to the amount carried in the GMP for that scope of work or upon any other basis approved by the City of Worcester.

2. Subcontracts With An Estimated Cost Less Than \$20,000. Subcontracts with an estimated cost less than \$20,000, and subcontracts for the supply of materials or equipment not including performance of labor in construction at the Project site, regardless of the estimated cost, may be awarded by the CM using any method selected by the CM with the approval of the City of Worcester.

### **III. OTHER PROCUREMENT PROVISIONS**

#### **A. Emergencies**

In case of an emergency, the City of Worcester or the CM, with the prior approval of the City of Worcester, may award a contract for such work as is necessary to preserve or protect the health or safety of persons or property on the basis of such competitive bids or proposals as it can reasonably obtain in time to respond to the emergency and without public advertisement or opening of bids or proposals; or the CM may perform such work with its own forces.

#### **B. Termination of Contracts**

Termination of Trade Contracts and Other Subcontracts. If a trade contract, or other subcontract, is terminated in whole or in part by the CM **after** the subcontractor commences work but prior to completion of the work covered by such trade contract or other subcontract on account of breach or default by the trade contractor or other subcontractor, or for other reasons in the public interest approved by the City of Worcester, the CM may engage a replacement subcontractor using any method selected by the CM and approved by the City of Worcester, or may perform the affected work with its own forces, as necessary to preserve, protect, or complete the work without following these procedures and without public advertisement or opening of bids or proposals. The termination of a trade or other subcontractor prior to completion of its work shall not be the basis for an increase in the GMP.

#### **C. Miscellaneous Provisions**

1. Procurement Records. The Prequalification Committee and the CM shall ensure that the City of Worcester has a complete set of the following records:
  - a. All RFQs issued pursuant to Section 2 of these Procedures, including all addenda.

- b. All City of Worcester's SOQs and other information furnished to or otherwise obtained by the Prequalification Committee and the CM concerning qualification of each Applicant responding to an RFQ including any references or scoring obtained or generated in connection with the SOQs.
- c. All RFBs issued by the CM to prequalified Trade Contractors pursuant to Section 3 of these Procedures.
- d. All bids received from such Trade Contractors in response to such RFBs.
- e. All solicitations for bids or proposals issued by the CM to firms other than Trade Contractors.
- f. All bids and proposals received by the CM from such firms in response to such solicitations.
- g. All contracts awarded pursuant to these procedures.
- h. All other written documents required pursuant to the terms of these Procedures.
- i. All other documents referring or relating to the evaluation of qualifications, proposals or bids, including but not limited to, all notes (to the extent included in Project files), memoranda, correspondence and meeting minutes, whether formal or informal, in either electronic media or hard copy.

The City of Worcester shall retain copies of such records for a period of six (6) years from the date of final payment under the contract to which such records relate. The Secretary of Administration and Finance and the Inspector General of the Commonwealth shall have access to all such records at any time upon reasonable notice.

- 2. Severability. If any provision of these Procedures shall be determined to be invalid or unenforceable, the remaining provisions of the Procedures shall remain in full force and effect.
- 3. Time. The periods of time within which any party is required to act under the terms of these procedures when described in terms of "days" shall, unless otherwise specified, mean calendar days (and not business days), except that if the last day of any such time period falls on a Saturday, Sunday, or legal holiday in Massachusetts, the period of time during which the required action must be taken will be extended to the next following business day.



## **APPENDIX D**

- Form for Subcontract between Construction Manager and Trade Contractor
- Form for Subcontract between Construction Manager and Subcontractor

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**COMMONWEALTH OF MASSACHUSETTS  
FORM FOR SUBCONTRACT BETWEEN CONSTRUCTION MANAGER AND TRADE  
CONTRACTOR AS SET FORTH IN THE CONTRACT DOCUMENTS**

THIS AGREEMENT made this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between

\_\_\_\_\_ a corporation organized and existing under the law of \_\_\_\_\_  
a partnership consisting of \_\_\_\_\_  
an individual doing business as \_\_\_\_\_  
hereinafter called the "Construction Manager or CM" and

\_\_\_\_\_ a corporation organized and existing under the laws of \_\_\_\_\_  
a partnership consisting of \_\_\_\_\_  
an individual doing business \_\_\_\_\_  
hereinafter called the "Trade Contractor" or "Subcontractor",

WITNESSETH that the CM and the Trade Contractor for the considerations hereafter named, agree as follows:

1. The Trade Contractor agrees to furnish all labor and materials required for the completion of all work specified in Section No. \_\_\_\_\_ of the Specifications for \_\_\_\_\_ (Name of Sub-trade) and the Plans referred to therein and addenda No. \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_ for the \_\_\_\_\_

\_\_\_\_\_ (complete title of project and project no. taken from the title page of the Specifications)  
all as prepared by \_\_\_\_\_

(Name of Designer or Engineer)

for the sum of \_\_\_\_\_ (\$\_\_\_\_\_)

and the CM agrees to pay the Trade Contractor said sum for said work. This price includes the following alternates (and other items set forth in the sub-bid):

Alternate No(s) \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_,  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.

(a) The Trade Contractor agrees to be bound to the CM by the terms of the hereinbefore described Plans, Specifications (including all general conditions stated herein) and addenda Nos. \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_, and to assume to the CM all the obligations and responsibilities that the CM by those documents assumes to the \_\_\_\_\_

\_\_\_\_\_ hereinafter called the “Awarding Authority,” except to the extent that provisions contained herein are by their terms or by law applicable only to the CM.

(b) The CM agrees to be bound to the Trade Contractor by the terms of the hereinbefore described documents and to assume to the Trade Contractor all the obligations and responsibilities that the Awarding Authority by the terms of the hereinbefore described documents assumes to the CM, except to the extent that provisions contained therein are by their terms or by law applicable only to the Awarding Authority. The Trade Contractor shall preserve and protect the rights of the City of Worcester under the Contract Documents with respect to the Work to be performed by the Trade Contractor so that the subcontracting thereof will not prejudice such rights, and shall be subject to the Record Retention requirements as set forth in the Contract Documents.

2. The CM agrees to begin, prosecute and complete the entire work specified by the Awarding Authority in an orderly manner so that the Trade Contractor will be able to begin, prosecute and complete the work described in this subcontract; and, in consideration thereof, upon notice from the CM, either oral or in writing, the Trade Contractor agrees to begin, prosecute and complete the work described in this Subcontract in an orderly manner and with due consideration to the date or time specified by the Awarding Authority for the completion of the entire work.

3. The Trade Contractor agrees to furnish to the CM within a reasonable time after the execution of this subcontract, evidence of workmen’s compensation insurance as required by law and evidence of public liability and property damage insurance of the type and in limits required to be furnished to the Awarding Authority by the CM.

4. The CM agrees that no claim for services rendered or materials furnished by the CM to the Trade Contractor shall be valid unless written notice thereof is given by the CM to the Trade Contractor during the first ten (10) days of the calendar month following that in which the claim originated.

5. The Trade Contractor agrees that it shall enter into similar agreements, as this, with its Subcontractors, except to the extent that provisions contained herein are by their terms or by law applicable only to the CM and/or Contractor.

6. The CM agrees that it has provided to the Trade Contractor, prior to the execution of this Subcontract, copies of the Contract Documents to which the Trade Contractor will be bound by this Subcontract. The Trade Contractor agrees that it shall similarly make copies of such Contract Documents available to its Subcontractors.

7. In the event of termination of the Contract due to the default of the CM or for any other reason, the City of Worcester shall have the right (but shall have no obligation) to assume, and/or accept assignment of and further assign to a general contractor or construction manager or other third party who is qualified and has sufficient resources to complete the Work, the rights of the CM under the Subcontract with such Trade Contractor. In the event of such assumption or assignment by the City of Worcester, the Trade Contractor shall have no claim against the City of Worcester or such third party for work performed by such Trade Contractor or other matters

arising prior to termination of the Contract, and the DCAM or such third party, as the case may be, shall be liable only for obligations to the Trade Contractor arising after such assumption or assignment.

8. Nothing contained herein, shall be construed to create any contractual relationship between the Trade Contractor and the City of Worcester.

9. This agreement is contingent upon the execution of a Contract for Construction Management Services between the CM and the Awarding Authority for the complete work.

IN WITNESS WHEREOF, the parties hereto have executed this agreement the day and year first above-written.

SEAL ATTEST

\_\_\_\_\_

\_\_\_\_\_  
(Name of Trade Contractor)

By: \_\_\_\_\_

SEAL ATTEST

\_\_\_\_\_

\_\_\_\_\_  
(Name of CM)

By: \_\_\_\_\_

\_\_\_\_\_  
(City and State)

**THIS FORM MAY BE REPRODUCED**

called the "Awarding Authority", except

that provisions contained herein are by



**COMMONWEALTH OF MASSACHUSETTS  
FORM FOR SUBCONTRACT BETWEEN CONSTRUCTION MANAGER AND  
SUBCONTRACTOR OTHER THAN TRADE CONTRACTOR AS SET FORTH  
IN THE CONTRACT DOCUMENTS**

THIS AGREEMENT made this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_, by and between

\_\_\_\_\_ a corporation organized and existing under the law of \_\_\_\_\_  
a partnership consisting of \_\_\_\_\_  
an individual doing business as \_\_\_\_\_  
hereinafter called the "Construction Manager or CM" and

\_\_\_\_\_ a corporation organized and existing under the laws of \_\_\_\_\_  
a partnership consisting of \_\_\_\_\_  
an individual doing business \_\_\_\_\_  
hereinafter called the "Subcontractor",

WITNESSETH that the CM and the Subcontractor for the considerations hereafter named, agree as follows:

1. The Subcontractor agrees to furnish all labor and materials required for the completion of all work as follows: \_\_\_\_\_

\_\_\_\_\_ (attach additional sheets as necessary)  
according to the Specifications and Plans referred to therein and addenda No. \_\_\_\_\_,  
\_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_ for the

\_\_\_\_\_ (complete title of project and project no. taken from the title page of the Specifications)  
all as prepared by \_\_\_\_\_  
(Name of Designer or Engineer)

for the sum of \_\_\_\_\_ (\$\_\_\_\_\_) and the CM agrees to pay the Subcontractor said sum for said work. This price includes the following alternates (and other items set forth in the sub-bid):

Alternate No(s) \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_,  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.

(a) The Subcontractor agrees to be bound to the CM by the terms of the hereinbefore described Plans, Specifications (including all general conditions stated herein) and addenda No. \_\_\_\_\_, and \_\_\_\_\_, and \_\_\_\_\_, and to assume to the CM all the obligations and responsibilities that the CM by those documents assumes to the \_\_\_\_\_ hereinafter

(Awarding Authority)

their terms or by law applicable only to the CM.

(b) The CM agrees to be bound to the Subcontractor by the terms of the hereinbefore described documents and to assume to the Subcontractor all the obligations and responsibilities that the Awarding Authority by the terms of the hereinbefore described documents assumes to the CM, except to the extent that provisions contained therein are by their terms or by law applicable only to the Awarding Authority. The Subcontractor shall preserve and protect the rights of the City of Worcester under the Contract Documents with respect to the Work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights, and shall be subject to the Record Retention requirements as set forth in the Contract Documents.

2. The CM agrees to begin, prosecute and complete the entire work specified by the Awarding Authority in an orderly manner so that the Subcontractor will be able to begin, prosecute and complete the work described in this subcontract; and, in consideration thereof, upon notice from the CM, either oral or in writing, the Subcontractor agrees to begin, prosecute and complete the work described in this Subcontract in an orderly manner and with due consideration to the date or time specified by the Awarding Authority for the completion of the entire work.

3. The Subcontractor agrees to furnish to the CM within a reasonable time after the execution of this subcontract, evidence of workmen's compensation insurance as required by law and evidence of public liability and property damage insurance of the type and in limits required to be furnished to the Awarding Authority by the CM.

4. The CM agrees that no claim for services rendered or materials furnished by the CM to the Subcontractor shall be valid unless written notice thereof is given by the CM to the Subcontractor during the first ten (10) days of the calendar month following that in which the claim originated.

5. The Subcontractor agrees that it shall enter into similar agreements, as this, with its Subcontractors, except to the extent that provisions contained herein are by their terms or by law applicable only to the CM and/or Contractor.

6. The CM agrees that it has provided to the Subcontractor, prior to the execution of this Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Subcontract. The Subcontractor agrees that it shall similarly make copies of such Contract Documents available to its Subcontractors.

7. In the event of termination of the Contract due to the default of the CM or for any other reason, the City of Worcester shall have the right (but shall have no obligation) to assume, and/or accept assignment of and further assign to a general contractor or construction manager or other third party who is qualified and has sufficient resources to complete the Work, the rights of the CM under the Subcontract with such Subcontractor. In the event of such assumption or assignment by the City of Worcester, the Subcontractor shall have no claim against the City of Worcester or such third party for work performed by such Subcontractor or other matters arising prior to termination of the Contract, and the City of Worcester or such third party, as the case

may be, shall be liable only for obligations to the Subcontractor arising after such assumption or assignment.

8. Nothing contained herein, shall be construed to create any contractual relationship between the Subcontractor and the City of Worcester.

9. This agreement is contingent upon the execution of a Contract for Construction Management Services between the CM and the Awarding Authority for the complete work.

IN WITNESS WHEREOF, the parties hereto have executed this agreement the day and year first above-written.

SEAL ATTEST

\_\_\_\_\_

\_\_\_\_\_  
(Name of Subcontractor)

By: \_\_\_\_\_

SEAL ATTEST

\_\_\_\_\_

\_\_\_\_\_  
(Name of CM)

By: \_\_\_\_\_

\_\_\_\_\_  
(City and State)

**THIS FORM MAY BE REPRODUCED**



**DOCUMENT 00 72 01**

**CITY OF WORCESTER SUPPLEMENTAL  
GENERAL CONDITIONS**

**(CITY OF WORCESTER DOCUMENT 00300)**

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CITY OF WORCESTER

**SUPPLEMENTARY GENERAL CONDITIONS**

STATUTORY PROVISIONS FOR MASSACHUSETTS  
PUBLIC CONSTRUCTION CONTRACTS

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CITY OF WORCESTER

**SUPPLEMENTARY GENERAL CONDITIONS**

**STATUTORY PROVISIONS FOR MASSACHUSETTS  
PUBLIC CONSTRUCTION CONTRACTS**

The following provisions are required by or are intended to be consistent with requirements of Massachusetts's statutes governing public construction contracts in the Commonwealth of Massachusetts (hereinafter referred to as the "Commonwealth"). Any other provisions required by statute to be included herein shall be deemed to be so included. In addition, the parties recognize that other rights, duties, and obligations with respect to public construction contracts are provided for by statute, notwithstanding the fact that they are not provided for in the Contract Documents. In case of conflict between the provisions of these Supplementary General Conditions and other provisions in the Contract Documents, the provisions of these Supplementary General Conditions shall govern. In case of conflict between the provisions of these Supplementary General Conditions and the provisions of any applicable statute, the statutory provisions shall govern. Where the term "Awarding Authority" appears in the following paragraphs, it shall be taken as meaning the Owner.

**ARTICLE 1 - PAYMENT, CONTRACT ADMINISTRATION, etc.**

- 1.1** "Or Equal" Clause: (Statutory reference: M.G.L. Chapter 30, Section 39M(b)). This Paragraph 1.1 applies to every contract for the construction, reconstruction or repair of any public work or for the purchase of any material by the Commonwealth, any political subdivision thereof, or any county, city, town, district or housing authority (above certain dollar limits, as stated in the statute), and to contracts awarded pursuant to M.G.L. Chapter 149, Sections 44A through 44H. The said Sections 44A through 44H apply to every contract for the construction, reconstruction, installation, demolition, maintenance or repair of any building by a department, agency, board, commission, authority, or other instrumentality or the Commonwealth or political subdivision thereof, or two or more subdivisions thereof, but not including the Massachusetts Bay Transportation Authority, estimated to cost more than a dollar amount set forth in M.G.L. Chapter 149, Section 44A.
- 1.1.1** Where products or materials are prescribed by manufacturer name, trade name, or catalog reference, the words "or approved equal" shall be understood to follow. An item shall be considered equal to the item so named or described if, in the opinion of the Architect:
- (1) It is at least equal in quality, durability, appearance, strength, and design;
  - (2) It performs at least equally the function imposed in the general design for the work;
  - (3) It conforms substantially, even with deviations, to the detailed requirements for the items as indicated by the specifications.

- 1.1.2** Any structural or mechanical changes made necessary to accommodate substituted equipment under this paragraph shall be at the expense of the Contractor or Subcontractor responsible for the work item. See other paragraphs of General and Supplementary Conditions for procedures to be used in determining compliance with the standards of this paragraph.
- 1.2** Delays: (Statutory reference: Chapter 30, Section 39O). This Paragraph 1.2 applies to every contract subject to M.G.L. Chapter 30, Section 39M and to every contract subject to Chapter 149, Sections 44A through 44H.
- 1.2.1** Except as otherwise provided by law and by this Paragraph 1.2, the Contractor shall not be entitled to damages on account of any hindrances or delays, avoidable or unavoidable; but if such delay be occasioned by the Awarding Authority, the Contractor may be entitled to an extension of time only, in which to complete the work, to be determined by the Architect.
- (1) The Awarding Authority may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the Awarding Authority; provided, however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the Awarding Authority to act within a time as may be otherwise specified in this contract and without the fault or negligence of the Contractor, the Awarding Authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit or overhead to the Contractor on such increase; and provided further, that the Awarding Authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.
- (2) The Contractor must submit the amount of a claim under provision (a) to the Awarding Authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract, and except for costs due to a suspension order, the Awarding Authority shall not approve any costs in the claim incurred more than twenty days before the Contractor notified the Awarding Authority in writing of the act or failure to act involved in the claim.
- (a) In the event a suspension, delay, interruption or failure to act of the Awarding Authority increases the cost of performance of any Subcontractor, that Subcontractor shall have the same rights against the Contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the Contractor against the Awarding Authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the Contractor or the Subcontractor may have against each other.
- 1.3** Deviations: (Statutory reference: M.G.L. Chapter 30, Section 39I). This Paragraph 1.3 applies to every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the Commonwealth or any political subdivision thereof.

- 1.3.1** The Contractor shall perform all the work required by this contract in conformity with the Drawings and Specifications contained herein. No willful and substantial deviation from said Drawings and specifications shall be made unless authorized in writing by the Awarding Authority or by the Engineer or Architect in charge of the work who is duly authorized by the Awarding Authority to approve such deviations. In order to avoid delays in the prosecution of the work required by such contract, such deviation from the Drawings or Specifications may be authorized by a written order of the Awarding Authority or such Engineer or Architect so authorized to approve such deviation. Within thirty (30) days thereafter, such written order shall be confirmed by a certificate of the Awarding Authority stating: (1) If such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefore (2) that the specified deviation does not materially injure the project as a whole; (1) that either the work substituted for the work specified is the same cost and quality, or that an equitable adjustment has been agreed upon between the Awarding Authority and the Contractor and the amount in dollars of said adjustment; and (4) that the deviation is in the best interest of the Awarding Authority.
- 1.3.2** Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.
- 1.4** Finality of Decisions by Awarding Authority or Architect: (Statutory reference: M.G.L. Chapter 30, Section 39J). This Paragraph 1.4 applies to every contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or public works by the Commonwealth or by any county, city, district, board, commission, or other public body, when the amount of the contract exceeds the amount stated in M.G.L. Chapter 30, Section 39J.
- 1.4.1** Notwithstanding any contrary provision of this contract, no decision by the Awarding Authority or by the Architect on a dispute, whether of fact or of law, arising under said contract shall be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, or arbitrarily, is unsupported by substantial evidence, or is based upon error of law.
- 1.5** Differing Site Conditions: (Statutory reference: M.G.L. Chapter 30, Section 39N). This Paragraph 1.5 applies to every contract subject to M.G.L. Chapter 30, Section 39M and to every contract subject to M.G.L. Chapter 149, Sections 44A through 44H.
- 1.5.1** If, during the progress of the work, the Contractor or the Awarding Authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the Drawings or indicated in the Contract Documents, either the Contractor or the Awarding Authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a Contractor, or upon its own initiative, the Awarding Authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the



Drawings or indicated in the Contract Documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Drawings and Contract Documents and are such a nature as to cause an increase or decrease in the cost of the work, the Awarding Authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly.

- 1.6** Timely Decision by Awarding Authority: (Statutory reference: M.G.L. Chapter 30, Section 39P). This Paragraph 1.6 applies to every contract subject to M.G.L. Chapter 30, Section 39M, and to every contract subject to M.G.L. Chapter 149, Sections 44A through 44H.
- 1.6.1** In every case in which this contract requires the Awarding Authority, any Official, its Architect or Engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, the decision shall be made promptly and, in any event, no later than thirty (30) days after the written submission for decision; but if such decision requires extended investigation and study, the Awarding Authority, the Official, Architect or Engineer shall, within thirty (30) days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty (30) day period and the date by which the decision will be made.
- 1.7** Certificate of Appropriation: (Statutory reference: M.G.L. Chapter 44, Section 31C). This Paragraph 1.7 applies to contracts for construction, reconstruction, alteration, remodeling, repair or demolition of any public building or public work by any city or town costing more than the amount set forth in M.G.L. Chapter 44, Section 31C.
- 1.7.1** This Contract shall not be deemed to have been made until the auditor or accountant or other officer of the city or town having similar duties has certified thereon that an appropriation in the amount of this contract is available therefore and that an officer of the city, town, or Awarding Authority has been authorized to execute said contract and approve all requisitions and change orders. No order to the Contractor for a change in or addition to the work, whether in the form of a drawing, plan, detail or any other written instruction, unless it is an order which the Contractor is willing to perform without any increase in the contract price, shall be deemed to be given until the auditor or accountant, or other officer of the Awarding Authority having similar duties, has certified thereon that an appropriation in the amount of such order is available therefore; but such certificate shall not be taken as an admission by the Awarding Authority of its liability to pay for such work. The certificate of the auditor or accountant or other officer of the Awarding Authority having similar duties, that an appropriation in the amount of this contract or in the amount of such order is available shall bar any defense by the Awarding Authority on the ground of insufficient appropriation.
- 1.8** Method of Payment: (Statutory reference: M.G.L. Chapter 30, Section 39K). This Paragraph 1.8 applies to every contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building by the Commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount is more than two thousand dollars (\$2,000).

- 1.8.1** Within fifteen (15) days after receipt from the Contractor, at the place designated by the Awarding Authority if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the awarding authority will make a periodic payment to the Contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed upon in writing) to which the Contractor has title or to which a Subcontractor has title and has authorized the Contractor to transfer title to the Awarding Authority, less (1) a retention based on its estimate of the full value of its claims against the Contractor and less (2) a retention for direct payments to Subcontractors based on demands for same in accordance with the provisions of Paragraph 1.10 of these Supplementary General Conditions, and less (3) a retention not exceeding five (5) percent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five (65) days after (a) the Contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the Awarding Authority, less than one percent of the original contract price, or (b) the Contractor substantially completes the work and the Awarding Authority takes possession for occupancy, whichever occurs first, the Awarding Authority shall pay the contractor the entire balance due on the contract less (1) a retention based on its estimate of the fair value of its claims against the Contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to Subcontractors based on demands for same in accordance with the provisions of Paragraph 1.10 of these Supplementary General Conditions, or based on the record payments by the Contractor to the Subcontractors under this contract if such record of payment indicates that the Contractor has not paid Subcontractors as provided in Paragraph 1.10. If the Awarding Authority fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of three (3) percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen (15) days after receipt of such periodic estimate from the Contractor, at the place designated by the awarding authority if such a place is so designated. The Contractor agrees to pay to each Subcontractor a portion of any such interest paid in accordance with the amount due each Subcontractor.
- 1.8.2** The Awarding Authority may make changes in any periodic estimate submitted by the Contractor, and the payment due on said periodic estimate shall be computed in accordance with the change so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided, that the Awarding Authority may, within seven (7) days after receipt, return to the Contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such periodic estimate shall be the date of receipt of the corrected periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter.

- 1.8.3** All periodic estimates shall be submitted to the Awarding Authority, or to its designee as set forth in writing to the Contractor, and the date of receipt by the Awarding Authority or its designee shall be marked on the estimate. All periodic estimates shall contain a separate item for each subtrade and each sub-subtrade, listed in the sub-bid form as required by the specifications, and a column listing the amount paid to each subcontractor and sub-subcontractor as of the date the periodic estimate is filed. The person making payment for the Awarding Authority shall add the daily interest provided for herein to each payment for each day beyond the due date based on the date of receipt marked on the estimate.
- 1.8.4** A certificate of the Architect to the effect that the Contractor has fully or substantially completed the work shall, subject to the provisions of Paragraph 1.4 of these Supplementary General Conditions, be conclusive for the purposes of this Paragraph 1.8.
- 1.8.5** Notwithstanding the provisions of this section, at any time after the value of the work remaining to be done is, in the estimation of the awarding authority, less than 1 per cent of the adjusted contract price, or the awarding authority has determined that the contractor has substantially completed the work and the awarding authority has taken possession for occupancy, the awarding authority may send to the general contractor by certified mail, return receipt requested, a completed and final list of all incomplete and unsatisfactory work items, including, for each item on the list, a good faith estimate of the fair and reasonable cost of completing such item. The general contractor shall then complete all such work items within 30 days of receipt of such list or before the contract completion date, whichever is later. If the general contractor fails to complete all incomplete and unsatisfactory work items within 45 days after receipt of such items furnished by the awarding authority or before the contract completion date, whichever is later, subsequent to an additional 14 days' written notice to the general contractor by certified mail, return receipt requested, the awarding authority may terminate the contract and complete the incomplete and unsatisfactory work items and charge the cost of same to the general contractor and such termination shall be without prejudice to any other rights or remedies the awarding authority may have under the contract. The awarding authority shall note any such termination on the evaluation form to be filed by the awarding authority pursuant to the provisions of section 44D of chapter 149.
- 1.9** Method of Payment: (Statutory reference: M.G.L. Chapter 30, Section 39G). This Paragraph 1.9 applies to every contract for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways; including bridges and other highway structures, sewers and water mains, airports and other public works entered into with the Commonwealth, or any agency or political subdivision thereof.
- 1.9.1** Upon substantial completion of the work required by a contract with the Commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and water mains, airports and other public works, the contractor shall present in writing to the Awarding Authority its certification that the work has been substantially completed. Within twenty-one (21) days thereafter, the Awarding Authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The Awarding Authority may include with such list a notice

setting forth a reasonable time, which shall not in any event be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the Awarding Authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the contractor's certification within the twenty-one (21) day period, the contractor's certification shall take effect as the Awarding Authority's declaration that the work has been substantially completed.

- 1.9.2** Within sixty-five (65) days after the effective date of a declaration of substantial completion, the Awarding Authority shall prepare and forthwith send to the contractor for acceptance a substantial completion estimate for the quality and price of the work done and all but one (1) per cent retainage on that work, including the quantity, price and all but one (1) percent retainage for the undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The Awarding Authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payments filed by subcontractors and not yet paid to subcontractors or deposited in joint accounts pursuant to Section 1.10, but no contract subject to said Section 1.10 shall contain any other provision authorizing the Awarding Authority to deduct any amount by virtue of claims asserted against the contract by subcontractors, material suppliers or others.
- 1.9.3** If the Awarding Authority fails to prepare and send to the contractor any substantial completion estimate required by section 1.9.2, on or before the date herein above set forth, the Awarding Authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such substantial completion estimate, at the rate of three (3) percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the Awarding Authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefore, whichever occurs first. The Awarding Authority shall include the amount of such interest in the substantial completion estimate.
- 1.9.4** Within fifteen (15) days after the effective date of the declaration of substantial completion, the Awarding Authority shall send to the contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and unless delayed by causes beyond his control, the contractor shall complete all such work items within forty-five (45) days after the receipt of such list or before the then contract completion date, whichever is later. If the contractor fails to complete such work within such time, the Awarding Authority may, subsequent to seven (7) day's written notice to the contractor by certified mail, return receipt requested, terminate the contract and complete the incomplete or unsatisfactory work items and charge the cost of same to the contractor.
- 1.9.5** Within thirty (30) days after receipt by the Awarding Authority of a notice from the contractor stating that all of the work required by the contract has been completed, the Awarding Authority shall prepare and forthwith send to the contractor for acceptance, a final estimate for the quantity and price of the work done and all retainage on that work less the payments made to date, unless the Awarding Authority's inspection shows that work items required by the contract remain incomplete or unsatisfactory, or that documentation required by the contract has not been completed. If the Awarding

Authority fails to prepare and sends to the contractor the final estimate within thirty (30) days after receipt of notice of completion, the Awarding Authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth (30th) day after such completion until the date on which the Awarding Authority sends the final estimate to the contractor for acceptance or the date of payment therefore, whichever occurs first, provided that the Awarding Authority's inspection shows that no work items required by the contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided.

- 1.9.6** The Awarding Authority shall pay the amount due pursuant to any periodic substantial completion or final estimate within thirty-five (35) days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth (35) day to the date of payment. In the case of periodic payments, the Awarding Authority may deduct from its payment a retention based on its estimate of the fair value of its claim against the contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of Section 1.10, and a retention to secure satisfactory performance of the contractual work not exceeding five (5) percent of the approved amount of any periodic payment, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under Section 1.10; provided, that a five percent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.
- 1.9.7** No periodic, substantial completion or final estimate or acceptance or payment thereof shall bar a contractor from reserving all rights to dispute the quantity and amount of, or the failure of the Awarding Authority to approve a quantity and amount of, all or part of any work item or extra work item.
- 1.9.8** Substantial completion, for the purpose of this Paragraph 1.9, shall mean either that the work required by the contract has been completed except for work having a contract price of less than one (1) percent of the then adjusted total contract price, or substantially all of the work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract.
- 1.10** Direct Payment: (Statutory reference: M.G.L. Chapter 30, Section 39F). This Paragraph 1.10 applies to every contract awarded pursuant to M.G.L. Chapter 149, Sections 44A through 44H, and (with the exception of Subparagraph 1.10.9) to every contract awarded pursuant to M.G.L. Chapter 30, Section 39M.
- 1.10.1** Forthwith after the Contractor receives payment on account of a periodic estimate, the Contractor shall pay to each subcontractor the amount paid for the labor performed and the materials furnished by that Subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the Contractor.
- 1.10.2** Not later than the sixty-fifth day after each Subcontractor substantially completes the work in accordance with the Drawings and Specifications, the entire balance due under

the subcontract, less amounts retained by the Awarding Authority as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the Subcontractor; and the Awarding Authority shall pay that amount to the Contractor. The Contractor shall forthwith pay to the Subcontractor the full amount received from the Awarding Authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the Contractor.

- 1.10.3** Each payment made by the Awarding Authority to the Contractor pursuant to Subparagraphs 1.10.1 and 1.10.2 of this Paragraph 1.10 for the labor performed and the materials furnished by a Subcontractor shall be made to the Contractor for the account of that Subcontractor; and the Awarding Authority shall take reasonable steps to compel the Contractor to make each such payment to each such Subcontractor. If the Awarding Authority has received a demand for direct payment from a Subcontractor for any amount which has already been included in a payment to the Contractor or which is to be included in a payment to the Contractor for payment to the Subcontractor as provided in Subparagraphs 1.10.1 and 1.10.2, the Awarding Authority shall act upon the demand as provided in this Paragraph 1.10.
- 1.10.4** If, within seventy (70) days after the Subcontractor has substantially completed the subcontract work, the Subcontractor has not received from the Contractor the balance due under the subcontract including any amount due for extra labor and materials furnished to the Contractor, less any amount retained by the Awarding Authority as to the estimated cost of completing the incomplete and unsatisfactory items of work, the Subcontractor may demand direct payment of that balance from the Awarding Authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the Awarding Authority, and a copy shall be delivered to or sent by certified mail to the Contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the Subcontractor has substantially completed the subcontract work. Within ten (10) days after the Subcontractor has delivered or so mailed the demand to the Awarding Authority and delivered or so mailed a copy to the Contractor, the Contractor may reply to the demand. The reply shall be a sworn statement delivered to or sent by certified mail to the Awarding Authority, and a copy shall be delivered to or sent by certified mail to the Subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract, including any amount due for extra labor and materials furnished to the Contractor and of the amount due for each claim made by the Contractor against the Subcontractor.
- 1.10.5** Within fifteen (15) days after receipt of the demand by the Awarding Authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the Awarding Authority shall make direct payment to the Subcontractor of the balance due under the subcontract, including any amount due for extra labor and materials furnished to the Contractor, less any amount (i) retained by the Awarding Authority as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the Contractor in the sworn reply; provided that the Awarding Authority shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by Subparagraph 1.10.4.

The Awarding Authority shall make further direct payments to the Subcontractor forthwith after the removal of the basis for deduction from direct payments made as provided in parts (I) and (ii) of this Subparagraph.

- 1.10.6** The Awarding Authority shall forthwith deposit the amounts deducted from a direct payment as provided in part (iii) of Subparagraph 1.10.5 in an interest-bearing joint account in the names of the Contractor and the Subcontractor in a bank in Massachusetts selected by the Awarding Authority or agreed upon by the Contractor and the Subcontractor and shall notify the Contractor and the Subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the Contractor and the Subcontractor or as determined by decree of a court of competent jurisdiction.
- 1.10.7** All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to Subparagraph 1.10.6 shall be made out of amounts payable to the Contractor at the time of receipt of a demand for direct payment from a Subcontractor and out of amounts which later become payable to the Contractor and in the order or receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the awarding authority to the Contractor to the extent of such payment.
- 1.10.8** The Awarding Authority shall deduct from payments to a Contractor amounts, which together with the deposits in interest-bearing accounts pursuant to Subparagraph 1.10.6, are sufficient to satisfy all unpaid balances of demands for direct payments received from Subcontractors. All such amounts shall be earmarked for such direct payments, and the Subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the Contractor.
- 1.10.9** If the Subcontractor does not receive payment as provided in Subparagraph 1.10.1 or if the Contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the Subcontractor and the Subcontractor does not receive payment for same when due less the deductions provided for in Subparagraph 1.10.1, the Subcontractor may demand direct payment by following the procedure in Subparagraph 1.10.4 and the Contractor may file a sworn reply as provided in that same Subparagraph. A demand made after the first day of the month following that for which the Subcontractor performed or furnished the labor and materials for which the Subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the Contractor. Thereafter the Awarding Authority shall proceed as provided in Subparagraphs 1.10.5, 1.10.6, 1.10.7 and 1.10.8.
- 1.10.10** Any assignment by a Subcontractor of the rights under this Section to a Surety company furnishing a bond under the provisions of M.G.L. Chapter 149, Section 29 shall be invalid. The assignment and subrogation court against the Awarding Authority and the Contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this paragraph. M.G.L. Chapter 231, Sections 59 and 59B shall apply to such petitions. The Court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to Sections 59 and 59B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The

court shall not consolidate for trial the petition of any Subcontractor with the petition of one or more Subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such price in equity in the superior court against the other and the bank shall not be a necessary party. A Subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in Subparagraph 1.10.6 by a petition in equity in the superior court against the Awarding Authority and the Contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this paragraph. M.G.L. Chapter 231, Sections 59 and 59B shall apply to such petitions. The Court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to Sections 59 and 59B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal there from as from a final decree. The court shall not consolidate for trial the petition of any Subcontractor with the petition of one or more Subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a Subcontractor filing a demand for direct payment for which no funds due the Contractor are available for direct payment shall have a right to file a petition in a court of equity against the Awarding Authority claiming a demand for direct payment is premature, and such Subcontractor must file the petition before the Awarding Authority has made a direct payment to the Subcontractor and has made a deposit of the disputed portion as provided in part (iii) of Subparagraph 1.10.5 and in Subparagraph 1.10.6.

**1.10.11** "Subcontractor" as used in this Paragraph 1.10 (I) for contracts awarded as provided in M.G.L. Chapter 149, Sections 44A-44H, inclusive, shall mean a person who files a sub-bid and receives a subcontract as a result of that filed sub-bid or who is approved by the Awarding Authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the Contractor, and (ii) for contracts awarded as provided in M.G.L. Chapter 30, Section 39M(a), shall mean a person approved by the Awarding Authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor.

**1.10.12A** Contractor or a Subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposited as provided in Subparagraph 1.10.6 by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A Subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in Subparagraph 1.10.6 by a petition in equity in the superior court against the Awarding Authority and the Contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this paragraph. M.G.L. Chapter 231, Sections 59 and 59B shall apply to such petitions. The Court shall enter an interlocutory decree upon which execution shall issue for any part of



a claim found due pursuant to Sections 59 and 59B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal there from as from a final decree. The court shall not consolidate for trial the petition of any Subcontractor with the petition of one or more Subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a Subcontractor filing a demand for direct payment for which no funds due the Contractor are available for direct payment shall have a right to file a petition in a court of equity against the Awarding Authority claiming a demand for direct payment is premature, and such Subcontractor must file the petition before the Awarding Authority has made a direct payment to the Subcontractor and has made a deposit of the disputed portion as provided in part (iii) of Subparagraph 1.10.5 and in Subparagraph 1.10.6.

**1.10.13** In any petition to collect any claim for which a Subcontractor has filed a demand for direct payment the court shall, upon motion of the Contractor, reduce by the amount of any deposit of a disputed amount by the Awarding Authority as provided in part (iii) of Subparagraph 1.10.5 and in subparagraph 1.10.6 any amount held under a trustee writ or pursuant to a restraining order or injunction.

**1.11** Discharge or Release of Bonds (Statutory reference: M.G.L. Chapter 30, Section 40). This Paragraph 1.11 applies to every contract awarded for the construction or repair of public buildings or other public works.

**1.11.1** Bonds given to the Commonwealth, any county, city, town or political subdivision to secure the performance of contracts for the construction or repair of public buildings or other public works may be discharged or released by the Awarding Authority, upon such terms as it deems expedient, after the expiration of one (1) year from the time of completion, subject to Section 39 K, of the work contracted to be done; provided that no claim filed under said bond is pending, and provided further, that no such bonds shall be discharged or released prior to the expiration of all special guarantees provided for in the contract unless new bonds in substitution therefore specifically relating to the unexpired guarantees shall be taken.

## **ARTICLE 2 - WAGES AND EMPLOYMENT PRACTICES**

**2.1** Preference To Veterans and Citizens In Public Works; Rate of Wages: (Statutory reference: M.G.L. Chapter 149, Section 26) This Paragraph 2.1 applies to every contract or subcontract for the construction of public works by the Commonwealth or by a county, town or district.

**2.1.1** In the employment of mechanics and apprentices, teamsters, chauffeurs and laborers, preference shall first be given to citizens of the Commonwealth who have been residents of the Commonwealth for at least six (6) months at the commencement of their employment, who are veterans as defined in M.G.L. Chapter 4, Section 7, Clause 43, and who are qualified to perform the work to which the employment relates; and secondly, to

citizens of the Commonwealth generally who have been residents of the Commonwealth for at least six (6) months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States, and every contract for such work shall contain a provision to this effect. Each county, town or district in the construction of public works, or persons contracting or subcontracting for such works, shall give preference to veterans and citizens who are residents of such county, town or district.

- 2.1.2** The rate per hour of the wages paid to said mechanics and apprentices, teamsters, chauffeurs and laborers in the construction of public works shall not be less than the rate or rates of wages to be determined by the Commissioner of Labor and Industries as hereinafter provided; provided that the wages paid to laborers employed on said works shall not be less than those paid to laborers in the municipal service of the town or towns where said works are being constructed; provided further, that where the same public work is to be constructed in two (2) or more towns, the wages paid to laborers shall not be less than those paid to laborers in the municipal town paying the highest rate; provided further, that if, in any of the towns where the works are to be constructed, a wage rate or wage rates have been established in certain trades and occupations by collective agreements or understandings between organized labor and employers, the rate or rates to be paid on said works shall not be less than the rates so established; provided further, that in towns where no such rate or rates have been established, the wages paid to mechanics, teamsters, chauffeurs and laborers on public works shall not be less than the wages paid to the employees in the same trades and occupations by private employers engaged in the construction industry. This section shall also apply to regular employees of the Commonwealth or a county, town or district, when such employees are employed in the construction, addition to or alteration of public buildings for which special appropriations of more than one thousand (\$1,000.00) dollars are provided. Payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans under collective bargaining agreements or understandings between organized labor and employers shall be included for the purpose of establishing minimum wage rates as herein provided.
- 2.2** List of Jobs; Classifications; Determination of Rate of Wages; Schedule: (Statutory reference: M.G.L. Chapter 149, Section 27). This Paragraph 2.2. applies to every contract or subcontract for the construction of public works by the Commonwealth, or by a county, town or district.
- 2.2.1** The Commissioner of Labor and Industries shall prepare, for the use of such public officials or public bodies whose duty it shall be to cause public works to be constructed, a list of the several jobs usually performed on various types of public works upon which mechanics and apprentices, teamsters, chauffeurs and laborers are employed. The Commissioner shall classify said jobs, and he may revise such classifications from time to time, as he may deem advisable. Prior to awarding a contract for the construction of public works, said public official or public body shall submit to the Commissioner a list of the jobs upon which mechanics and apprentices, teamsters, chauffeurs and laborers are to be employed, and shall request the Commissioner to determine the rate of wages to be paid on each job. The Commissioner, subject to the provisions of Paragraph 2.1 of these Supplementary General Conditions, shall proceed forthwith to determine the same, and shall furnish said official or public body with a schedule of such rate or rates of wages as soon as said determination shall have been made. In advertising or calling for bids for

said works, the Awarding Authority or public body shall incorporate said schedule in the advertisement or call for bids by an appropriate reference thereto, and shall furnish a copy of said schedule without cost, to any person requesting the same. Said schedule shall be made a part of the contract for said works and shall continue to be the minimum rate or rates of wages for said employees during the life of the contract. Any person engaged in the construction of said works shall cause a legible copy of said schedule to be kept posted in a conspicuous place at the site of said works during the life of the contract. The aforesaid rates of wages in the schedule of wage rates shall include payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans as provided in the previous section, and such payments shall be considered as payments to persons under this section performing work as herein provided. Any employer engaged in the construction of such works who does not make payments to a health and welfare plan, a pension plan and supplementary unemployment benefit plan, where such payments are included in said rates of wages, shall pay the amount of said payments directly to each employee engaged in said construction. Note: The Awarding Authority does not guarantee the accuracy of any schedule of wage rates furnished to the Contractor hereunder, and the Contractor shall be responsible for ascertaining the prevailing wages in the area where the work will be performed.

- 2.3** Employment Records To Be Kept By Contractor, Subcontractors; Statement of Compliance: (Statutory reference: M.G.L. Chapter 149, Section 27B). This Paragraph 2.3 applies to every contract or subcontract for the construction of public works by the Commonwealth, or by a county, town or district.
- 2.3.1** Every Contractor, Subcontractor or public body engaged in said public works to which Paragraph 2.3 of these Supplementary General Conditions applies shall keep a true and accurate record of all mechanics and apprentices, teamsters, chauffeurs and laborers employed thereon, showing the name, address and occupational classification of each such employee and shall furnish to the Commissioner of Labor and Industries, upon his request, a copy of said record, signed by the employer or his authorized agent under the penalties of perjury. Such records shall be open to inspection by any authorized representative of the Department of Labor and Industries at any reasonable time, and as often as may be necessary.
- 2.3.2** Each such Contractor, Subcontractor or public body shall preserve its payroll records for a period of three (3) years from the date of completion of the contract.
- 2.3.3** Each such Contractor, Subcontractor or public body shall furnish to the Commissioner of Labor and Industries within fifteen (15) days after completion of its portion of the work a statement, executed by the Contractor, Subcontractor, or public body who supervises the payment of wages, in the following form.

STATEMENT OF COMPLIANCE

I \_\_\_\_\_  
(Name of Signatory Party) (Title)

Do hereby state:

That I pay or supervise the payment of the persons employed by

\_\_\_\_\_  
(Contractor, Subcontractor or Public Body)

On the \_\_\_\_\_ and that all mechanics  
(Building or Project)

And apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions of Sections 26 and 27 of Chapter 149 of the General Laws.

Signature \_\_\_\_\_

Title \_\_\_\_\_

The above-mentioned copies of payroll records and statements of compliance shall be available for inspection by any interested party filing a written request to the Contractor for such inspections.

**2.4** Wages Paid to Operators of Trucks and Other Equipment: (Statutory reference: M.G.L. Chapter 149, Section 27F). This Paragraph 2.4 applies to every contract for the construction of public works by the Commonwealth, or by a county, city, town or district.

**2.4.1** Prescribed rates of wages, as determined by the Commissioner of Labor and Industries, shall be paid to the operators of all trucks, vehicles or equipment employed on the Project. Said rates of wages shall be requested of said Commissioner by the Awarding Authority and shall be furnished by the Commissioner in a schedule containing the classification of jobs, and the rate of wage to be paid for each job. Said rates of wages shall include payments to health and welfare plans, or, if no such plan is in effect between employers and employees, the amount of such payments shall be paid directly to said operators.

**2.5** Reserve Police Officers: (Statutory reference: M.G.L. Chapter 149, Section 34B). This Paragraph 2.5 applies to every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public works for the Commonwealth or any political subdivision thereof.

**2.5.1** The contractor shall pay to any reserve police officer employed by him in any city or town the prevailing rate of wages paid to regular police officers in such city or town.

- 2.6** Eight-Hour Day, etc.: (Statutory reference: M.G.L. Chapter 149, Sections 30, 34, and 34A). This Paragraph 2.6 applies only to contracts, which are subject to the provisions of the aforesaid Sections of the Massachusetts General Laws.
- 2.6.1** No laborer, worker, mechanic, foreman or inspector working within this Commonwealth in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the contract, shall be required or permitted to work more than eight (8) hours in any one (1) day or more than forty-eight (48) hours in any one (1) week, or more than six (6) days in any one (1) week, except in cases of extraordinary emergency.
- 2.7** Lodging, etc.: (Statutory reference: M.G.L. Chapter 149, Section 25). This paragraph 2.7 applies to every contract for the doing of public work with the Commonwealth, a county, city or town, or with a department, board, commission, or officer acting therefore.
- 2.7.1** Every employee under this contract shall lodge, board and trade where and with whom he elects, and neither the Contractor nor his agents or employees shall, either directly or indirectly, require as a condition of the employment of any person that the employee shall lodge, board or trade at a particular place or with a particular person.
- 2.8** Access to Contractor's Records: (Executive Order No. 195). This Paragraph 2.8 applies to every contract for the purchase of services or materials by any agency, bureau, board, commission, institution, or department of the Commonwealth or a municipal contract funded, in whole or in part, by the Commonwealth.
- 2.8.1** The Governor or his Designee, the Secretary of Administration and Finance, and the State Auditor or his Designee shall have the right at reasonable times and upon reasonable notice to examine the books, records and other compilations of data of the Contractor which pertain to the performance and requirements of this contract.
- 2.9** Worker's Compensation Insurance: (Statutory reference: M.G.L. Chapter 149, Section 34). This Paragraph 2.9 applies to every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or other public works for the Commonwealth or any political subdivision thereof.
- 2.9.1** The Contractor shall, before commencing performance of the contract, provide by insurance for the payment of and the furnishing of other benefits under M.G.L. Chapter 152 to all persons to be employed under the contract, and the Contractor shall continue such insurance in full force and effect during the term of the contract. Sufficient proof of compliance with this Paragraph 2.9 must be furnished at the time of execution of this contract. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the contract and shall operate as an immediate termination thereof. No cancellation of such insurance, whether by the insurer or by the insured, shall be valid unless written notice thereof is given by the party proposing cancellation to other party and to the Awarding Authority at least fifteen (15) days prior to the intended effective date thereof, which date shall be expressed in said notice.

### **ARTICLE 3 - CONTRACTOR'S ACCOUNTING METHOD REQUIREMENTS**

- 3.1** (Statutory reference: M.G.L. Chapter 30, Section 39R). This Article 3 applies to "Contracts" and "Contractors", as defined in Subparagraph 3.1.1 and 3.1.2, below.
- 3.1.1** "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to Section 39M of Chapter 30, Sections 44A-44J inclusive, of Chapter 149, and Sections 30B-30P, inclusive, of Chapter 7.
- 3.1.2** "Contract" means any contract awarded or executed pursuant to Sections 30B-30P, inclusive, of Chapter 7, and any contract awarded or executed pursuant to Section 39M of Chapter 30, or Sections 44A-44H, inclusive, of Chapter 149, which is for an amount or estimated amount that exceeds the dollar amount set forth in M.G.L. Chapter 30, Section 39R.
- 3.1.3** "Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.
- 3.1.4** "Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his/her residence or principal office who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the Awarding Authority.
- 3.1.5** "Audit", when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a CERTIFIED opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.
- 3.1.6** "Accountant's Report", when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he/she has made and sets his/her opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed, the reasons therefore shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the auditing financial statement is a true and complete statement of the financial condition of the Contractor.
- 3.1.7** "Management", when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the Contractor.

- 3.1.8** Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.
- 3.2** Subparagraph 3.1.2 hereof notwithstanding, every agreement or contract awarded or executed pursuant to Sections 30B-30P, inclusive, of Chapter 7, and pursuant to Section 39M of Chapter 30 or to Sections 44A-44H, inclusive, of Chapter 149, shall provide that:
- 3.2.1** The Contractor shall make, and keep for at least six (6) years after final payment, books, records, and accounts, which in reasonable detail accurately and fairly reflect the transactions and dispositions of the Contractor.
- 3.2.2** Until the expiration of six (6) years after final payment, the Awarding Authority, office of inspector general, and the Deputy Commissioner of Capital Planning and Operations shall have the right to examine any books, documents, papers or records of the Contractor or his/her Subcontractors that directly pertain to, and involve transactions relating to, the Contractor or his/her Subcontractors.
- 3.2.3** If the agreement is a contract as defined herein, the Contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the Awarding Authority, including in his/her description the date of the change and reasons therefore, and shall accompany said description with a letter from the Contractor's independent certified public accountant approving or otherwise commenting on the changes.
- 3.2.4** If the agreement is a contract as defined herein, the Contractor has filed a statement of management on internal accounting controls as set forth in Paragraph 3.3 below prior to the execution of the contract.
- 3.2.5** If the agreement is a contract as defined herein, the Contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in Paragraph 3.5 below.
- 3.3** Every Contractor awarded a contract shall file with the Awarding Authority a statement of management as to whether the system of internal accounting controls of the Contractor and its subsidiaries reasonably assures that:
- 3.3.1** Transactions are executed in accordance with management's general and specific authorization;
- 3.3.2** Transactions are recorded as necessary;
- (1) To permit preparation of financial statements in conformity with generally accepted accounting principles, and
- (2) To maintain accountability for assets;
- 3.3.3** Access to assets is permitted only in accordance with management's general or specific authorization;

- 3.3.4** The recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.
- 3.4** Every Contractor awarded a contract shall also file with the Awarding Authority a statement prepared and signed by an independent certified public accountant, stating that he/she has examined the statement of management on internal accounting controls, and expressing an opinion as to:
- 3.4.1** Whether the representations of management in response to this paragraph and Paragraph 3.2 above are consistent with the result of management's evaluation of the system of internal accounting controls; and
- 3.4.2** Whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts, which would be material when measured in relation to the applicant's financial statements.
- 3.5** Every Contractor awarded a contract by the Commonwealth or by any political subdivision thereof shall annually file with the Awarding Authority during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report.

#### **ARTICLE 4 - MISCELLANEOUS**

- 4.1** Weather Protection: This Paragraph 4.1 applies to every contract subject to M.G.L. Chapter 149, Section 44A.
- 4.1.1** The Contractor shall install weather protection and provide adequate heat in the protected area from November 1 to March 31, as required by M.G.L. Chapter 149, Section 44F(1).
- 4.2** Form for Sub-contract: This Paragraph 4.2 applies to every contract subject to M.G.L. Chapter 149, Section 44A.
- 4.2.1** The Contractor when sub-contracting with sub-bidders filed pursuant to M.G.L. Chapter 149, Section 44F shall use the form for sub-contract in Chapter 149, Section 44F(4)(c).
- 4.3** Foreign Corporations: This Paragraph 4.3 applies to every contract with the Commonwealth, a county, city, town, district, board, commission, or other public body for the construction, reconstruction, alteration, remodeling, repair, or demolition of any public building or other public works.
- 4.3.1** The Contractor, if a foreign corporation, shall comply with M.G.L. Chapter 181, Sections 3 and 5, and Chapter 30, Section 39L.
- 4.4** Shoring: (Statutory reference: M.G.L. Chapter 149, Section 129A). This Paragraph 4.4 applies to every construction project carried on by any city, town, county, or other subdivision of the Commonwealth in which a trench is to be dug to a depth of six and one-half (6 ½) feet which will be open less than forty-eight (48) hours, and except for digging of graves.



- 4.4.1** Trenches shall be shored and braced in conformity with rules and regulations relating thereto, adopted and enforced by the Department of Labor and Industries.
- 4.5** Certification of Compliance with Tax Laws: (Statutory reference: M.G.L. Chapter 62C, Section 49A). This Paragraph 4.5 applies to contracts for goods or services furnished by any department, board, commission, division, authority, district or other agency of the Commonwealth or any subdivision of the Commonwealth, including a city, town or district.
  - 4.5.1** By executing this contract, the Contractor certifies, under penalties of perjury, that to the best of his information, knowledge and belief he has complied with all laws of the Commonwealth relating to taxes.
- 4.6** Verification of Construction Debris Disposal: Worcester Revised Ordinances, Chapter 8, Section 7. This Paragraph 4.7 shall apply to every contract entered into by the City of Worcester for the demolition, renovation, rehabilitation, or alteration of a building or structure.
  - 4.6.1** In furtherance of the requirements set forth in M.G.L. Chapter 40, Section 54, and Section 114.1.3 of the Massachusetts State Building Code, the Code Director shall require any person who obtains a permit for the demolition, renovation, rehabilitation, or alteration of a building or structure to provide verification that the debris resulting from such activities was disposed of at the licensed solid waste facility named in conjunction with the permit application.
  - 4.6.2** The verification required under sub-section (a.), above, shall consist of the following:
    - 4.6.2.1** A dated receipt, signed by the owner/operator of the licensed solid waste disposal facility where the debris was deposited.
    - 4.6.2.2** The receipt shall contain a description of the debris disposed of, and its weight, or volume.
    - 4.6.2.3** The permit holder shall also provide the Code Director with an affidavit that the receipt submitted is true and accurate to the best of the permit holder's knowledge.
    - 4.6.2.4** If the permit holder cannot dispose of the debris at the location indicated, it shall be the permit holder's obligation to obtain an amendment to the permit reflecting the new disposal location. The Code Director shall be so notified, and the permit amended, prior to the disposal of the debris at the new disposal location.
  - 4.6.3** This Section shall not apply to the construction of a new building or structure.
- 4.7** Responsible Employer Ordinance: (Worcester Revised Ordinances, Chapter 2, Section 35) This paragraph shall apply to every contract entered into by the City of Worcester for the construction, reconstruction, installation, demolition, maintenance or repair of any building, where the contract amount is more than one hundred thousand dollars (\$100,000).

- 4.7.1** The city council hereby finds and determines that the failure of certain construction firms awarded contracts funded by the city to include and enforce provisions requiring compliance with state laws governing the payment of prevailing wages, the provision of workers compensation coverage, and the proper classification of individuals as employees and not as independent contractors, as well as provisions concerning health insurance coverage and state-certified apprenticeship programs, is injurious to the life, health and happiness of individuals employed by such firms and is deleterious to the quality of life in the city where most of such individuals reside.
- 4.7.2** Every contract awarded by the city under G.L. c. 149, § 44A(2) where the amount of the contract is more than one-hundred thousand dollars, and any subcontract awarded in connection with any such general contract where the amount of such subcontract is more than twenty-five thousand dollars, shall be deemed to incorporate by reference the provisions of sub-parts (1) through (6) of this subsection together with the provisions of subsections (c), (d) and (e) of this section.
- 4.7.2.1** The bidder and all subcontractors under the bidder shall comply with the city residents jobs ordinance codified as § 32 of chapter two of the Revised Ordinances of 1996;  
**(Compliance with the City Residents Jobs Ordinance is currently suspended)**
- 4.7.2.2** The bidder and all subcontractors under the bidder shall comply with the requirements of G.L. c. 149 concerning the payment of prevailing wage rates to their employees;
- 4.7.2.3** The bidder and all subcontractors under the bidder must maintain and participate in a bona fide apprentice training program as defined by G.L. c. 23, §§ 11H & 11I for each apprenticeable trade or occupation represented in its workforce that is approved by the division of apprentice training of the Department of Labor and Industries of the Commonwealth and must abide by the apprentice to journeymen ratio for each trade prescribed therein in the performance of the contract; COMPLIANCE WITH APPRENTICE TRAINING PROVISIONS OF THE RESPONSIBLE EMPLOYER ORDINANCE IS CURRENTLY SUSPENDED.
- 4.7.2.4** ' NOT USED  
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- 4.7.2.5** The bidder and all subcontractors under the bidder must maintain appropriate industrial accident insurance coverage in accordance with G.L. c. 152 for all individuals employed on the project;
- 4.7.2.6** The bidder and all subcontractors under the bidder must properly classify individuals employed on the project as employees rather than independent contractors and comply with all laws concerning workers' compensation insurance coverage, unemployment taxes, social security taxes and income taxes as respects all such employees.
- 4.7.3** All bidders and all subcontractors under such bidders who are awarded, or otherwise obtain, contracts from the city on projects governed by G.L. c. 149, § 44A(2), shall

comply with the obligations described in sub-parts (1) through (6) of subsection (b) of this section for the entire duration of their work on the project, and an officer of each such bidder or subcontractor under the bidder shall certify under oath and in writing on a weekly basis that they are in compliance with these obligations.

**4.7.4** Any bidder or subcontractor under the bidder who fails to comply with any of the obligations described in sub-parts (1) through (6) of subsection (b) of this section for any period of time or fails to comply with the weekly certification obligations described in subsection (c) of this section shall be subject to any or all of the following sanctions:

**4.7.4.1** Temporary suspension of work on the project until compliance is obtained; or,

**4.7.4.2** Withholding by the city of payment due under the contract until compliance is obtained; or,

**4.7.4.3** Permanent removal from any further work on the project; or,

**4.7.4.4** Recovery by the city from the general contractor of 1/10 of 1 % of the general contract or one thousand dollars (\$1000.00), whichever is greater, in the nature of liquidated damages assessed for each week that the general contractor is in non-compliance or, if a subcontractor is in non-compliance, the recovery by the City from the general contractor as a back-charge against the subcontractor of 1/10 of 1% of the subcontract price, or \$400.00, whichever is greater, in the nature of liquidated damages assessed for each week that the subcontractor is in non-compliance.

**4.7.5** In addition to these sanctions a general bidder or contractor shall be equally liable for any violation of the obligations described in sub-parts (1) through (6) of subsection (b) of this section committed by any of its subcontractors or sub-bidders, excepting only those violations which arise from work performed by subcontractors with subcontracts governed by G.L. c. 149, § 44F. Any contractor or subcontractor who has been determined to have violated any of the provisions of subsections (b) or (c) of this section shall be barred from performing any work on any future contracts awarded by the city for six (6) months for the first violation, three (3) years for the second violation, and permanently for a third violation.

**4.7.6** The provisions of this section shall not apply to construction projects for which the low general bid was less than one-hundred thousand dollars, (\$100,000) or to work performed pursuant to subcontracts governed by G.L. 149, §44F where the bid for such subcontract was less than twenty-five thousand dollars (\$25,000).

**4.8** Regulation of Construction Noise: (Worcester Revised Ordinances, Chapter 8, Section 34). This paragraph 4.8 shall apply to anyone operating powered construction equipment or delivering construction equipment and/or supplies at any construction site or project within the city of Worcester.

**4.8.1** It shall be unlawful for any person, firm, corporation, partnership, or other entity to warm up or operate powered construction equipment or to build, erect, construct, demolish, alter, repair, excavate or engage in hoisting, grading, site work, including tree and brush removal, dredging or pneumatic hammering, or to deliver construction equipment and/or supplies to the site on any building, road, tower, parking lot, machine, pipe, sewer,

sidewalk, or any other construction project (hereafter collectively the “construction project”), except between the hours of 7:00 a.m. and 9:00 p.m. on weekdays and Saturday, and between the hours 9:00 a.m. and 7:00 p.m. on Sundays except for “emergency work” which is performed in the interest of public safety or welfare and for which a permit has been issued by the commissioner of Code Enforcement (the Commissioner).

**4.8.2** Emergency work permits may be issued in:

**4.8.2.1** Cases of urgent necessity and for the interests of health, safety and convenience of the public. The Commissioner shall consider whether the reasons given for the urgent necessity are valid and reasonable, and whether the health, safety and convenience of the public will be protected or better served by granting the permit requested and whether the manner and amount of loss or inconvenience to the party in interest imposes a significant hardship; or,

**4.8.2.2** Cases where because the location and nature of the work the noise caused by said work will not be heard by anyone not working on the project. The Commissioner shall consider whether supplying machinery and/or materials to the construction project site will cause unreasonable noise along the routes to the construction project site, and whether such activity will impact residential neighborhoods, and shall not grant any emergency work permit unless unreasonable noise in residential areas will be prevented.

**4.8.2.3** Emergency work permits may be issued to the general contractor on a blanket basis that applies to all of the contractors working on the job, or may be issued to specific contractors on the construction project, at the discretion of the Commissioner. Emergency work permits may be issued for not more than one week at a time, and may be renewed for additional one-week periods at the discretion of the Commissioner.

**4.8.2.4** Prior to issuing or reissuing said emergency work permit the Commissioner shall review the work being conducted and all attendant circumstances, and shall prescribe whatever limitations possible to minimize the generation of noise, and to minimize the impact of noise on the neighbors to the construction project.

**4.8.2.5** Emergency repair work performed by the Department of Public Works and/or any public utility is exempt from this section.

**4.8.2.6** The fee for each such Emergency work permits issued under this section shall be set in accordance with Chapter 2, § 24 of these ordinances.

**4.8.2.7** On any project for the construction, construction, installation, demolition, maintenance or repair of any building, or public work, to be funded in whole or in part by city funds, or funds which, in accordance with a federal or state grant, program, or otherwise, the city expends or administers, or any such project to which the city is a signatory to the contract therefore, the provisions of this section shall apply and the same shall be referenced in every invitation to bid for such project and, the following paragraphs shall be contained in every resulting contract there from:

- (1) “It shall be a material breach of this contract if the contractor and each subcontractor on shall not at all times adhere to the provisions of § 34 of chapter eight of the

Revised Ordinances of the city, by limiting their on-site, noise producing construction and related work to the hours specified by the Ordinance.

- (2) A waiver from the above requirements may, in certain circumstances, be granted in accordance with subsections (b), (c) and (d) of § 34 of chapter eight of the Revised Ordinances of the city.”

**4.8.2.8** The Commissioner of the Department of Code Enforcement shall have the authority to adopt any rules and regulations he or she deems necessary to implement this section.

**4.8.2.9** Nothing in this section shall be deemed to prevent an individual from performing work on his or her own property, so long as the work is being done by the owner of the property or by direct relatives of the owner, and said work is not being done for profit.

**4.8.2.10** This ordinance may be enforced by any Building Inspector and/or Health and Code Inspector assigned by the Commissioner of the Departments of Public Health and Code Enforcement and the Police Department.

**4.8.2.11** Any violation of this ordinance by any person, firm, corporation, partnership, or other entity, shall be individually punished with a fine of \$100.00. Each day upon which a violation of this ordinance occurs shall be considered a separate violation. Employers shall be deemed the violator for violations committed by their employees.

**END OF SECTION 00300**



Section 00 73 00

**SUPPLEMENTARY INSTRUCTIONS TO  
BIDDERS**

These Supplementary Instructions to Bidders are intended to assist bidders in establishing items of work required as part of performance of their scope of work and shall be considered by trade contractors and non-trade contractors alike in the preparation of bids.

The items listed in this section are not intended to represent a complete list of work items to be performed under the referenced subcontractor's scope of work, rather they are intended to supplement language already included in the specifications and provide additional information to assist subcontractors in the preparation of bids.

Should any subcontractor require further clarification prior to submission of a bid, forward a Request for Information to Fontaine Bros. immediately.

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- 1. General Requirements and Inclusions for ALL Subcontractors**
- 2. Procedures and Requirements for Submission of Bids**
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- 13. Trade Specific Scope Notes**

- 1. General Requirements and Inclusions for ALL Subcontractors (Trade and Non-Trade).**

1. All components of these Supplementary Instructions to Bidders shall apply to all subcontractors. Provisions to comply with these conditions shall be included in bids.
2. In the Contract Documents, the word "Contractor", "General Contractor", "Trade Contractor" or "Subcontractor" shall mean and shall be interpreted as being the "Subcontractor" or "Trade Contractor" whose scope of work includes that portion of the work or specifications. In the event that work of a specification section is spread over several "scopes of work", each requirement shall apply to the subcontractor in regard to work being performed under their scope of work.
3. Subcontractors are responsible for complete and comprehensive review of contract drawings and specifications. Bid prices are assumed to include labor, materials, insurance, taxes, fees, and all other costs associated with delivering the complete scope of work in proper working order in accordance with the contract documents.
4. If a conflict exists between the drawings and specifications or within either document itself, the better quality or greater quantity of work shall be included in the subcontractor's bid. An RFI should be submitted immediately upon discovery of any such conflict. If an RFI is not submitted and work is commenced, this is done at the subcontractor's risk.
5. Whenever the contract documents require a professional engineer's stamp, review or

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

- report, it shall be understood to mean a Professional Engineer licensed and registered in the Commonwealth of Massachusetts.
6. Subcontractors shall be responsible for all permits, including associated fees, to complete their work (except the General Building Permit) and shall be responsible for coordinating, scheduling, and completing the associated inspections within the time period allotted for construction of their trade on the project schedule. Inspections shall be coordinated and completed in advance of contract dates when possible and at no extra cost at the direction of Fontaine Bros. Participate with the inspection walk throughs as required by the contract and as requested by the Construction Manager. Provide suitable access for inspectors to perform all tests or inspections. Contractor supplied temporary ladders and lifts to perform their work are to be available for the use of all parties.
  7. Subcontractors shall be responsible for all local hot work permits, fire watch details, and police details as may be required for their own work. Welders to obtain City of Worcester Welding Certificates. Subcontractors requiring a hot work permit must provide proof of completed training. Training shall be approved by the State Fire Marshal.
  8. Project communications, during both the bid and construction stages, shall be directed to Fontaine Bros. Direct communication with the design team, owner, owner's project manager etc. is prohibited.
  9. All employees on the worksite must have completed OSHA 10 Training.
  10. Theft or vandalism of tools, equipment, materials, etc. are not the responsibility of Fontaine Bros.
  11. Subcontractors shall provide offsite storage of all materials until installation, unless previously authorized by Fontaine Bros. to deliver and store materials on site. Materials brought to site must be palletized for ease of relocation at the direction of the CM to facilitate construction activities.
  12. Subcontractors whose scope of work includes the installation of materials shall include ALL fasteners, adhesives, and other components necessary for the complete a functional installation of materials within their scope of work UNLESS any of these components are specifically designated to another scope of work.
  13. CM to provide access to electronic documents, including CADD files after waiver is signed and returned. Subcontractor shall be responsible for procurement/maintenance of hard copy and electronic drawings, specifications, and shops drawings.
  14. CM to provide access to Procore project site, subcontractor to monitor project information and communications to identify and respond to all information including changes affecting their scope of work.
  15. Subcontractor is responsible for layout, CM will provide control points.
  16. All cutting/patching in masonry is by Masonry Subcontractor. All cutting/patching in other surfaces is by the subcontractor requiring the surfaces to be cut. All holes through structural steel noted on the contract set shall be located by subcontractors as part of the coordination documents for fab/install by steel subcontractor.
  17. All fire caulking and acoustical sealant at mechanical penetrations is by subcontractor requiring penetrations. All fire caulking and acoustical sealant not at mechanical penetrations is by drywall subcontractor. Mechanical subcontractors shall include Fire Protection, Plumbing, HVAC, Electrical subcontractor and their sub subcontractors.
  18. Subcontractor shall provide mock ups per specifications; subcontractor shall provide standalone mockups unless in place mockups are expressly permitted.
  19. There will be a mockup classroom completed inside of the building. Construction of the mockup room will be completed out of sequence and will be used for quality review and standard for all future construction.
  20. Subcontractors are responsible for provision of power for their equipment if equipment cannot be powered by available on-site sources. Electrical subcontractor



SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

- responsible for hooking up all equipment including special equipment such as masonry saws, grinders, and temporary heat equipment.
21. Subcontractors shall be responsible for any water required to operate their equipment that is not readily available on site. Temporary water may be used as available.
  22. Subcontractors shall be responsible for providing their employees with drinking water.
  23. All trades shall provide suspension systems/hangers/supports/seismic restraints as required for their respective equipment and work.
  24. Subcontractors shall provide their own task lighting required to complete their scope of work. Temporary construction lighting/power meeting or exceeding OSHA standards and as dictated in the specifications shall be provided by the electrical subcontractor.
  25. Deliveries shall be coordinated with Fontaine's site Superintendent a minimum of 48 hours in advance.
  26. Subcontractor work hours shall be between 7:00 AM and 5:00 PM, Monday through Saturday. Work shall not begin prior to 7:00 or continue past 5:00 PM Monday through Saturday nor shall work be performed on Sunday without previous permission from Fontaine Bros. and the City of Worcester. Work hours shall not be changed unless unusual circumstances require adjustment.
  27. Consideration will be given to all SOMWBA certified subcontractors, materials suppliers, fabricators, and service providers on this project.
  28. Review job conditions prior to commencing work. Advise Fontaine of any unacceptable conditions; commencement of work indicates subcontractor accepts job conditions.
  29. Contractual warranties shall commence upon the date that Fontaine Bros receives a Certificate of Occupancy for the building or date of final acceptance of system by OWNER, whichever is later. Subcontractor shall provide all necessary extended warranties to account for the time period from the completion of their work through July 1, 2021. Site Finishes warranty will begin June 1, 2022.
  30. Subcontractor shall provide Construction Daily Reports detailing daily manpower, activities and locations for subcontractor's work, and work of all employees and subcontractors for which this contractor is responsible. Reports shall be filled out and emailed to Fontaine daily.
  31. The CM shall have the right to assemble subcontractor personnel for orientation, quality, and safety related matters at no additional cost.
  32. Each subcontractor shall keep a sign-in book for their workers. Each worker must sign in and out daily and copies of the daily logs must be submitted to Fontaine Bros. on a weekly basis.
  33. Subcontractor shall provide any power required to perform work outside of the building. Outside power will not be provided by the Owner/Construction Manager.
  34. Each subcontractor is required to adhere to, participate in, and provide all items as described in the Indoor Air Quality Management Plan. Strict adherence to this plan is required by each subcontractor. Subcontractors shall take date stamped photos documenting compliance with such measures such as protection of absorptive materials, protection of ductwork, and source separation.
  35. Each subcontractor is responsible for provision of, coordination of, and installation of sleeving/penetrations required for their work in foundation walls, decking, slabs, walls and the like. Subcontractor whose system requires sleeving/penetrations shall be responsible for any coring, cutting, patching required for installation of your work if sleeving is not coordinated with other subcontractor at appropriate time. Sleeving required in early release package installations that is required to be furnished/installed prior to procurement of appropriate trades shall be furnished/installed by early release subcontractor whose assembly requires sleeving/coring. Subcontractors must coordinate to sleeves/cores located by early release subcontractor or provide new sleeves/cores in an alternate location.

Abandoned sleeves/cores must be repaired/patched by the subcontractor abandoning the penetration. Subcontractors are responsible for all coring associated with completing their scope of work. Holes greater than 4" shall not be cored without prior approval by CM.

36. Fontaine Bros. shall have discretion and authority to terminate subcontracts without recourse if, in the discretion of Fontaine Bros., the subcontractor in question is not fulfilling contract obligations including meeting schedule, manpower, material procurement or other goals/criteria.
37. Site subcontractor shall include snow removal for access and staging/storage areas and for access to staging and storage area as directed by Fontaine, including hand removal at trailers/entrances etc, for the duration of the project. Site contractor owns sanding site for access following snow or ice events. Each subcontractor shall provide snow removal for their own work.
38. Costs for material escalation shall be included in bid proposals. Costs for material escalation including asphalt, drywall, etc. shall be at the risk of the subcontractor.
39. All subcontractors shall take precautions against damaging the work of other trades including roofing. In the event that work is performed on the roof, subcontractors shall provide protection of the roof membrane to ensure that their work/materials does not puncture the roof membrane. In the event that subcontractors fail to provide protection or damage the roofing membrane, costs for repairs shall be borne by the offending subcontractor(s).
40. All subcontractors shall make provisions to provide a working computer for their foreman on site. Computer shall have access to the internet and shall also provide access to BIM model in the event that subcontractors are of mechanical trades. Subcontractors shall use computer to access shop drawings, submittals, etc. as necessary.
41. Manufacturer, supplier, and or subcontractor requirements that must be met prior to material delivery, installation, or fabrication must be made available to CM for review prior to acceptance of subcontractor's bid. Requirements not spelled out in the contract documents that are brought to the attention of the CM at a later date will not be considered. These include requirements having to do with building climate, warranties, and project specific conditions.
42. No person shall perform testing on site or related to the project without the prior direction and permission of the project team.
43. There shall be no deliveries or vehicles entering or exiting the site during busy hours at the school. Subcontractors shall adhere to a "blackout period" between 7:00 am and 7:30 am and between 1:30 pm and 2:30 pm while school is in session. CM has the discretion to modify the blackout hours as necessary to facilitate work.
44. Subcontractors shall not park on Apricot Street, the Worcester South Community School parking lots, the Sullivan Middle School parking lots, or any streets adjacent to the project site. Offsite parking and shuttling, if required, shall be paid for and arranged by subcontractors.
45. References to any project other than **Worcester South Community High School** are understood to be errors. Subcontractor shall assume to all references in specification apply to **Worcester South Community High School**, located in Worcester, MA.
46. All subcontractor personal working on site will be required to complete a Criminal Offender Record Information (CORI) check. Employment on site is subject to results of the CORI check. All CORI applications shall be submitted two weeks prior to starting on site.
47. All references in the contract documents to the Construction Manager/General Contractor as performing any field work or providing services in connection with any aspect of the work shall be understood to mean the subcontractor.

## **2. Procedures and Requirements for Submission of Bids**

1. Subcontractors shall submit bids for the project on the bid forms provided by Fontaine Bros. or the owner and in accordance with the instructions to bidders in the specifications. Bids shall include the complete scope of work included in each subcontractors bid package, exclusions shall not be considered.
2. By submitting a bid, subcontractor certifies that they have included provisions for complying with these supplementary instructions to bidders. Furthermore, subcontractor agrees to abide by these supplementary instructions to bidders. Subcontractor understands that execution of a contract certifies acceptance of these supplementary instructions to bidders.
3. Subcontractors submitting bids shall hold their bids for a minimum of 90 days.

### **3. Submittals**

1. This project will utilize Procore for document distribution and processing. Subcontractors will be given access to Procore upon contract award, and shall be furnished either instructions for use or, when available, given access to online training sessions regarding operation of the Procore website. All project communications must be submitted through Procore. Subcontractors shall be given access to Procore and shall pay no fee for access.
2. It is the intent of the project team to process and distribute documents electronically to the fullest extent possible. Subcontractors shall provide shop drawings, submittals, product data sheets, MSDS sheets, etc. in electronic format acceptable to the project team. In the event that shop drawings are large format, such as structural steel, millwork, etc., subcontractor shall provide up to (4) hard copies of each submission at no additional cost to the project. Hard copies of approved/corrected shop drawings shall be provided upon request by the CM at no additional cost. Color charts, physical samples, etc. shall be delivered hard copy with a transmittal and photo of each sample uploaded to Procore as a means to track the sample approval and/or color selection.
3. The Construction Manager shall maintain a database of electronic files available for access by subcontractors on the Procore website; subcontractors shall be responsible for reviewing electronic documents and taking appropriate action to ensure the incorporation of all project documents including RFI's, ASI's, etc. into their work. In addition, the construction manager may elect to utilize a Bluebeam Studio of electronic files available for access by subcontractors; subcontractors shall be responsible for reviewing electronic documents and taking appropriate action to ensure the incorporation of all project documents including RFI's, PR's, ASI's, etc. into their work.
4. Within (14) days of written notice of intent, subcontractor shall provide via email to Fontaine Bros. a submittal schedule for their work. Submittal schedule shall be in the format provided by Fontaine Bros. Failure to provide submittal schedule within (14) days of notice of intent shall result in payments to subcontractor being held until satisfactory submittal schedule is provided.
5. Within (14) days of written notice of intent, subcontractor shall provide via email to Fontaine Bros. a list of Long Lead Items to be procured under the scope of the subcontractor. Long Lead Items shall be defined as any item that requires more than (30) days from the time the item is approved and ordered until the item is delivered on site. Failure to provide a list of Long Lead Items within (14) days of intent shall result in payments to subcontractor being held until satisfactory list of Long Lead Items is provided.
6. Submittals for all contractors shall be due no later than 4 weeks from the date of notice of intent to award subcontractor.
  - a. Submittals for roof top units, air handling units, and other equipment requiring

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**SUPPLEMENTARY INSTRUCTIONS TO BIDDERS**

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coordination with the steel subcontractor, shall be due no later than 6 weeks from the date of notice of intent to award to subcontractor. Resubmittals for all subcontractors shall be due within 1 week after submittal is returned for revision.

- b. All samples for finishes requiring color selection by the design team shall be submitted within 4 weeks of notice of intent to award. Physical samples shall include the full range of colors available for each product and as outlined in the construction documents.

#### **4. Schedule**

1. Time is of the essence on this project, and subcontractors shall provide adequate manpower necessary to complete their scope of work within schedule durations outlined on Fontaine's construction schedule included within these bid documents. By submitting a bid, subcontractors acknowledge that they have reviewed the project schedule and included in their bids adequate manpower including overtime as may be necessary to achieve these durations.
2. Any overtime required to meet scheduled completion dates shall be provided at subcontractor's expense.
3. Subcontractors shall provide three week look ahead schedules in advance of weekly foremen's meeting on site. Subcontractors shall be responsible for reviewing schedules with Fontaine management and adhering to schedules. Subcontractors shall make adjustments to better schedules if possible and at the direction of Fontaine management.
4. Subcontractor shall perform all work within their scope in full cooperation with other trades and coordinate the schedule and sequence of work with all other trades under the direction of Fontaine's management team. When so directed, subcontractor shall temporarily omit, or perform certain portions of the work out of normal sequence, in order to accommodate schedule requirements. Claims for additional monies as a result of out of sequence work shall not be considered by Fontaine.
5. All mobilizations necessary to complete the work are to be included as part of the subcontractor's bid.
6. The subcontractor acknowledges that adjustments to the schedule may be required by all parties as construction progresses. Subcontractor agrees to accomplish adjustments at no increase in price.
7. It is understood that multiple crews will be required to perform concurrent work in different areas.
8. It is understood that utility shutdowns may have to be scheduled outside the normal work day. Any and all costs for this shall be included in bids.
9. No extension of time shall be granted because of seasonal or abnormal variations in temperature, humidity, or precipitation, which conditions shall be wholly at the risk of the subcontractor, whether occurring within the time originally scheduled for completion or within the period of any extension granted. There shall be no increase in the contract sum on account of any additional costs of operations or conditions resulting there from.
10. In the event of inclement weather, subcontractors shall make a determination as to whether they will require their tradespeople to report to work. There will be no compensation for such lost work days, and, at no cost to the owner/CM, the subcontractor shall make up the lost time through overtime, additional crews, or by other means necessary.

#### **5. Meetings**

1. Fontaine, at their discretion, may conduct multiple "kick-off" meetings including, but not limited to, a Green Building Kick-Off Meeting, a Project Schedule Kick-Off

Meeting, a Safety Kick-Off Meeting, and others deemed appropriate. Subcontractors shall arrange for a representative of their firm authorized to make binding commitments to be present at these meetings. Subcontractors shall be notified a minimum of five days prior to these meetings, and attendance is required unless otherwise directed by the Construction Manager.

2. Fontaine, at their discretion and in conjunction with the architect/OPM/Cx etc, shall hold preconstruction meetings for individual trades/work items. Subcontractors notified of meetings shall be required to attend as a prerequisite to starting or in some cases continuing work. When requested, subcontractors shall arrange for a representative of their firm authorized to make binding commitments to be present at these meetings. Attendance at these meetings is mandatory.
3. Fontaine shall conduct weekly meetings to review schedule, safety, logistics, and other relevant construction issues. At least once per week, each subcontractor notified by Fontaine shall arrange for a project manager responsible for the subcontractor's operations and able to make binding commitments to be present on site for a meeting. In addition to this project manager, subcontractor foreman shall attend this weekly meeting.
4. In the event that a subcontractor is notified of their required attendance at an onsite meeting, and the subcontractor fails to provide a project manager or foreman as required, Fontaine shall issue a written notice of non-compliance. In the event that a subcontractor fails a second time, Fontaine shall issue a fine of \$500. Fontaine shall issue a fine of \$500 for each subsequent failure, and these fines shall not be subject to appeal.

## **6. Safety**

1. Fontaine's Site-Specific Safety Program shall be strictly enforced. Subcontractors are responsible for reviewing the Safety Program provided in these documents and complying with the plan and OSHA standards.
2. All workers shall review new employee orientation requirements and sign, date and return a completed new employee orientation form to Fontaine Bros. site superintendent prior to commencing work on site.
3. Subcontractors shall provide (3) copies of their written safety plan on site at all times. (1) copy shall be maintained in the Fontaine Field Office, (1) copy shall be maintained in the subcontractor field office, and (1) copy shall be kept on site/in the building for the foreman to reference as construction progresses. It is the responsibility of each subcontractor to provide their written safety plan before commencing work on site.
4. A fall protection system that meets or exceeds OSHA Regulations is to be provided and maintained by each subcontractor at all times. Details of the fall protection program must be included in the written safety plan. All components of fall protections systems for each trade including anchors, lanyards, and harnesses are to be furnished, installed, maintained, and removed by each individual trade utilizing the fall protection system.
5. Subcontractors shall provide appropriate MSDS sheets to Fontaine's superintendent whenever delivering materials to the site. A complete MSDS book shall be kept on site at all times, containing MSDS sheets for all materials that are stored or being used on site.
6. All tools & equipment powered by electricity used by subcontractors are required to have ground fault circuit interrupters, supplied and maintained by the respective subcontractors. When using permanent power supply, the GFCI protection must be supplied and maintained by respective subcontractors as necessary.
7. No radios will be allowed on site. No headphones shall be worn on site. Hearing protection is acceptable for safety purposes only. Hearing protection shall be supplied by subcontractors for their employees.

8. All employees on site shall wear hard hats and high visibility clothing at all times. All employees shall wear safety glasses for task specific hazard protection. Subcontractor shall supply their employees with all required safety material.
9. Employees working outside of the building shall wear reflective safety vests at all times.
10. Subcontractor shall supply their employees with all required safety material.
11. Subcontractors shall supply employees with personal protective equipment such as safety glasses, face shields, respirators, gloves, concrete boots, etc. to be worn when appropriate.
12. All subcontractors shall comply with 6' fall protection rules. All fall protection equipment, including tie off points, shall be furnished and installed by subcontractors and shall be supplied by each employer.
13. Subcontractor shall adhere to all applicable safety regulations and shall be responsible for complying with safety requirements as defined in Section 13 of the General Conditions of the CM at Risk Contract as it relates to subcontractors' work on site.
14. Subcontractors shall furnish, install, maintain and remove tie downs and harnesses etc. for work that requires them. Roofer shall be responsible for patching holes in roof after tie downs are removed.

## **7. Payments and Requisitions**

1. Subcontractors shall submit a schedule of values to Fontaine Bros. within (14) days of receipt of subcontract/purchase order. Schedule of values shall be broken down to separate labor and material costs and shall reference either work components (i.e. reception desk for millwork), or work areas (i.e. Brick Veneer, CL 1-3/5/A5.1)
2. In addition to labor and material, each subcontractor Schedule of Values shall include line items for the following
  - a. Shop Drawings
  - b. Submittals
  - c. Coordination Drawings (if applicable)
  - d. LEED Compliance
  - e. Safety (3% of contract sum)
  - f. Daily Clean Up (3% of contract sum)
  - g. Closeout
  - h. Commissioning for applicable trades
3. If a mobilization line item is included, a demobilization line item of equal value shall be required.
4. Monthly Requisitions shall be emailed to Fontaine Bros. no later than 5:00 p.m. on **the third Thursday of each month**. Requisitions **must** be emailed to [AP@FontaineBros.com](mailto:AP@FontaineBros.com) , as well as to the Project Manager's email address. Requisitions not received by the third Thursday of the month to both email addresses may not be included in that month's requisition.
5. Stored materials shall be billed and paid for in accordance with the requirements of the project specifications.
6. Retainage of 5% shall be held in accordance with project specifications.
7. Requisition review and payment procedures shall be governed by applicable Mass General Laws.
8. Requisitions will be reviewed by the project team and in the event that the design team/owner determines not to pay a requisition or line item to the full value it has been billed, Fontaine will give notice to the subcontractor. Subcontractor shall send a revised requisition reflecting the change in values within 24 hours. Requisition shall be paid based upon this revised application for pay.
9. All subcontractor requisitions shall be formatted in Fontaine Bros. standard format for

this project.

## **8. Change Orders**

1. A change in the work may be initiated in one of three ways
  - a. CM may send a request for quotation with accompanying drawings, sketches, or details.
  - b. CM may receive formal notification from subcontractor via an RFI requesting CM and A/E review
  - c. In response to an RFI response or other project document that the subcontractor feels constitutes extra work, subcontractor may submit a request for a change order to CM.
2. In the event that Fontaine issues a request for quotation or subcontractor feels that an RFI response or field condition will require extra work, subcontractor must submit to Fontaine a formal change order request within (7) days. In the event that no change order request is received within this time frame, subcontractor shall waive rights to any additional compensation.
3. Subcontractor shall submit change order requests in a format acceptable to Fontaine. Breakdown shall include, at a minimum, direct labor costs, direct material costs, direct equipment costs, labor burden costs, bond costs, and any other significant cost associated with the work. Labor rates shall be as reflected in the prevailing wage rates included in this project manual plus applicable burden, or at direct union rates as appropriate. Labor rates shall not include small tools, travel, or other non-labor related items. Subcontractors shall also include written back-up for all materials purchased in conjunction with change order work.
4. Change order requests may include a markup for overhead and profit up to 10% on the direct cost of the work.

## **9. Housekeeping**

1. ALL subcontractors shall be responsible for daily cleanup to an onsite dumpster provided by Fontaine. All costs related to this cleanup including hoisting shall be carried by these subcontractors.
2. Subcontractors employing union laborers on site shall allot a total of 10 hours of laborer time per week to be dedicated to overall project clean up at the direction of Fontaine Bros. This allotment shall be in addition to the time required to satisfy each subcontractor's requirement to perform cleanup of their work daily, and this shall be tracked on a weekly basis. Total hours dedicated to FBI directed cleanup shall be equal to the number of weeks the firm is mobilized on site and employing union laborers multiplied by 10 hours per week. If the full 10 hours is not used each week, unused time shall be carried forward to the next week and vice versa.
3. Subcontractors are responsible for daily cleanup of all waste generated by their operations, including packing material, fasteners, razor blades, pallets, dunnage, cardboard boxes, paper products and food waste from breaks and lunch, snippets of wire, sheetmetal waste, excess studs, sheetrock, sawdust etc. Packing and crating materials shall be broken down into smaller pieces before being placed in the dumpster to conserve space.
  - a. Subcontractors shall separate waste on site as much as possible, including separating metal, concrete, wood, and cardboard products for disposal into segregated dumpsters.
  - b. Subcontractors shall comply with Fontaine's waste management plan and shall ensure that waste is separated on site into segregated dumpsters to the fullest extent possible. These segregated dumpsters include dumpsters for wood, metal, concrete, drywall, and general debris.

- c. In the event that a subcontractor fails to complete daily cleanup to the satisfaction of Fontaine's field personnel, Fontaine shall issue a written notice to the subcontractor. Upon issuance of this written notice, said subcontractor shall have 24 hours to clean the area to the satisfaction of Fontaine's field personnel.
- d. In the event that said subcontractor fails to complete cleanup to the satisfaction of Fontaine's field personnel within 24 hours of written notice, Fontaine shall have the right to
  - i. Stop the subcontractor from working until cleanup is complete.
  - ii. Undertake the obligations of the subcontractor via use of other labor forces and process a backcharge to the offending subcontractor's account with no further notice to the subcontractor. Costs for cleaning will be deducted from the next requisition and will not be subject to appeal.

#### **10. Hoisting, Staging, Unloading**

- 1. Subcontractors are responsible for provision of all hoisting, staging, bracing, scaffolding, and rigging required for completion of their work. Subcontractors shall comply with applicable laws and regulations regarding construction of staging, operation of lifts, and any other applicable requirements.
- 2. Subcontractors shall provide manpower and equipment necessary to accept delivery, unload, store as directed by Fontaine, protect, provide security, distribute, install in sequence directed by Fontaine, and clean any materials, systems and equipment furnished and installed by the subcontractor. Subcontractor shall provide the same except for the furnishing of materials to a common offloading point on site for any materials furnished by others and installed under the scope of work of subcontractor. Subcontractor shall document receipt of all materials, systems and equipment on forms acceptable to Fontaine Bros.
- 3. Subcontractors shall expect to leave out three areas on each floor to allow the load-in and load-out of materials. All work in this area will be performed out of sequence and near the completion of the project. Once the load-in areas are closed, subcontractors will be responsible for finding a suitable route to and from upper floors with materials. Elevators will not be made available.
- 4. Take note of building access and make provisions to ensure that equipment and materials will fit through permanent doorways and or structure. Any work required to create openings for removal of doors/windows or walls in areas where equipment will not fit through openings shall be paid for by the contractor requiring the opening/access.

#### **11. Logistics**

- 1. Space constraints on site shall not allow for subcontractors to place storage trailers or job trailers on the site. Subcontractors shall store off site and hoist/handle materials at no extra cost. Site contractor shall construct laydown areas with stone as required at no extra cost.
  - a. Fontaine shall provide, at a minimum, guaranteed onsite parking for each subcontractor's foreman only. Costs for offsite parking/transportation to and from offsite parking shall be paid by individual subcontractors and shall be included in bids.
  - b. Subcontractors shall NOT park on Apricot Street, school parking lots, or any other surrounding street and shall not park on private property surrounding the project.
  - c. Space constraints on the site shall not allow for subcontractors to store raw



material on the project site. Off-site storage shall be allotted for and provided as part of bids until the project is ready to accept the material and subcontractors are directed by Fontaine to deliver the material to the site.

## **12. Closeout**

1. Subcontractor shall provide all closeout documentation in PDF format, no later than 30 days after completion of subcontractors work or 60 days before scheduled substantial completion, whichever is sooner. Draft warranties shall also be provided at this time for review of form if not provided during the submittal process, final dates shall be changed as appropriate. Hard copies of closeout documents shall be provided if requested.
2. Subcontractors shall maintain as-builts during construction for monthly review and provide as-builts in both electronic and hard copy format as requested.
3. Subcontractors shall create their own punchlist and complete remedial work **prior** to architect or CM creating and distributing a punchlist.
4. Punchlist work shall be complete as soon as possible after punchlist is issued, but no later than 14 days after punchlist is issued.
5. All punchlist work not completed prior to occupancy will be performed off-hours at the Sole discretion of the CM and Owner. No compensation will be provided for this work, and subcontractor may incur additional costs should CM or Owner expend labor supervising work.
6. Approximately 30 days prior to the warranty expiration period, the CM, along with the owner, will re-inspect the work to prepare a warranty repair list of items to be corrected by each subcontractor. This subcontractor shall make the repairs and/or replacements listed within 14 days of the issuance of this warranty repair list. Failure to do so will result in this work being performed by others at this subcontractor's expense.
7. At the completion of the project and as a prerequisite to release of retainage, subcontractor shall submit a letter of compliance. This compliance letter shall state that all work has been completed in accordance with the contract documents, that the installation has been performed in accordance with all applicable codes, and that all fire resistance characteristics, as required by the Fire Department, have been met. This letter must be signed by an officer of the company.
8. All subcontractors shall supply to the CM a complete list of attic stock for the work of their subcontract. Lists shall be aggregated and coordinated by the CM and subcontractors shall comply with specified process for delivery, receipt, and storage of material. All attic stock must be from the same production run as the materials applied on the project.
9. All subcontractors shall cooperate fully with commissioning agent and perform tasks required of their scope of work as directed by Fontaine, the Cx, and other project team members.

## **13. Trade Specific Scopes of Work**

### **A. Abatement & Demolition**

1. Abatement/demolition contractor shall be responsible for all work required to complete scope including obtaining permits and approvals, exposing hazardous materials, and removing/disposing of materials in compliance with all applicable guidelines.
2. Subcontractor shall provide as part of their bid all temporary utilities and protection required to complete their work.

3. Subcontractor shall coordinate with other trades as necessary and shall make all efforts necessary to be prudent in demolition of existing building.

**B. Enabling**

1. Enabling Contractor shall prepare and submit a SWPPP plan within (10) days of notice of intent. Enabling contractor shall file or update all necessary notifications in a timely fashion to assure that work is able to start no later than June 18, 2018. In addition to SWPPP Plan specific to sitework activities, enabling contractor shall coordinate with SWPPP preparer to provide, at no additional cost to Fontaine Bros., a SWPPP for general construction activities. This SWPPP is in addition to the SWPPP provided solely for the enabling contractor and shall be prepared in conjunction with Fontaine and paid for by the enabling contractor.
2. Enabling contractor shall construct and maintain entrances as shown on contract documents and laydown areas as shown on Fontaine logistics plans for phase 1.
3. Enabling contractor shall clean Apricot Street as necessary during the enabling phase to ensure that dirt from construction operations is not tracked onto adjacent roads.
4. Enabling contractor shall notify and coordinate with DigSafe, Worcester DPW, MA-DOT and all other relevant utility companies and regulatory agencies to identify and avoid existing utilities when performing this work. Expose utilities adjacent to work by hand before proceeding with any excavation.
5. Enabling contractor shall be responsible for snow removal for vehicle and pedestrian access and egress, parking areas, staging areas, and other areas within the construction site as directed by Fontaine during enabling construction period. This includes removal via machinery as well as hand shoveling at walks, entrances, trailers, offices, and other areas as directed by CM.
6. Enabling contractor to include dewatering, shoring, sheeting, dust control as necessary. Enabling contractor shall provide source of temporary power and fuel for temporary power for their equipment when temporary power is not available.
7. Enabling contractor shall provide police details as necessary to ensure that traffic flow to and from Apricot Street is not interrupted.
8. Enabling contractor shall provide and maintain site fence as indicated in specifications during enabling phase. Enabling contractor shall move/rearrange site fence as necessary to facilitate work at no additional cost. Site fence shall be maintained until work included in the enabling phase is complete and accepted by the Construction Manager. Include relocation of site fence prior to the start of the 2018 school year as necessary to meeting phasing requirements. Include rental of the fence through July 1, 2021.
9. Enabling contractor shall furnish, install erosion control barriers. Maintain erosion control barriers through December 1, 2018. Erosion control barriers shown on the drawings are diagrammatic in nature and may not constitute all erosion control required to comply with regulatory guidelines. Enabling contractor shall provide all necessary erosion control as part of this contract at no additional cost.
10. Enabling contractor shall investigate site prior to submitting a bid to familiarize themselves with current conditions and to provide a complete and accurate bid. Enabling contractor shall verify extent of work required such as tree clearing, removal of site components, etc. and shall include in their bid price all labor and material necessary to complete these items of work as necessary to complete the project at no additional cost.
11. Protect inlets as shown, both inside and outside of limit of work lines shown on drawings.
12. Enabling contractor shall comply with all relevant regulations in regard to blasting. No dynamite shall be stored on site. Enabling contractor shall be responsible for conducting pre-blast survey.
13. Enabling contractor shall comply with the Order of Conditions issued by the City of

Worcester and shall report on and document compliance through completion.

14. Enabling contractor shall provide manpower, equipment, and materials necessary to respond to weather events prior to and while they are occurring. Enabling contractor shall not abandon site until authorized to do so by CM.
15. At limits of work adjacent to streets/sidewalks, provide 2 layers of erosion and sedimentation control or more as required to ensure that there is absolutely no runoff from the construction site to roadways, sidewalks etc.
16. Comply with MA-DOT Vehicular and Non-Vehicular access permit requirements.

**C. Sitework**

1. Sitework contractor shall prepare and submit a SWPPP plan within (10) days of notice of intent. Sitework contractor shall file or update all necessary notifications in a timely fashion to assure that work is able to start no later than November 1, 2018. In addition to SWPPP Plan specific to sitework activities, sitework contractor shall coordinate with SWPPP preparer to modify, maintain, and/or resubmit, at no additional cost to Fontaine Bros., a SWPPP for general construction activities. This SWPPP is in addition to the SWPPP provided solely for the site contractor and shall be prepared in conjunction with Fontaine and paid for by the site contractor.
2. Site contractor shall maintain existing entrances from the enabling phase. Sitework contractor shall construct and maintain all additional entrances as shown on contract documents and laydown areas as shown on Fontaine logistics plan. In addition to areas shown on plan, site contractor shall construct additional laydown/staging areas as directed by Fontaine Bros. during the course of construction activities at no additional cost.
3. Sitework contractor shall clean Apricot Street as necessary during construction period to ensure that dirt from construction operations is not tracked onto adjacent roads.
4. Sitework contractor shall notify and coordinate with DigSafe, Worcester DPW, MA-DOT and all other relevant utility companies and regulatory agencies to identify and avoid existing utilities when performing this work. Expose utilities adjacent to work by hand before proceeding with any excavation.
5. Sitework contractor shall be responsible for snow removal for vehicle and pedestrian access and egress, parking areas, staging areas, and other areas within the construction fence as directed by Fontaine during entire construction period. This includes removal via machinery as well as hand shoveling at walks, entrances, trailers, offices, and other areas as directed by CM.
6. Sitework contractor shall pave areas as they become available and at the direction of Fontaine Bros in order to provide a clean, safe work area. Sitework contractor shall not charge for additional mobilizations.
7. Sitework contractor shall excavate and backfill trenches for buried mechanical, plumbing, gas, fire protection and electrical utilities and pits for buried utility structures, inside and outside the building.
8. Sitework contractor to include dewatering, shoring, sheeting, dust control as necessary. Sitework contractor shall provide source of temporary power and fuel for temporary power for their equipment when temporary power is not available.
9. Sitework contractor shall provide police details as necessary to ensure that traffic flow to and from Apricot Street is not interrupted.
10. Sitework contractor shall maintain site fence as indicated in specifications and on phasing drawings. Sitework contractor shall accept the condition of the site fence and move/rearrange site fence as necessary to facilitate work at no additional cost. Site fence shall be maintained until such time that fence can be safely removed as directed by Fontaine Bros. Sitework contractor shall have fence removed at that time.

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11. Sitework contractor shall inspect and accept condition of erosion control barriers installed under the Site Enabling Bid Package prior to submitting a bid. Site Contractor shall furnish, install, and maintain erosion control barriers throughout the project. Erosion control barriers shown on the drawings are diagrammatic in nature and may not constitute all erosion control required to comply with regulatory guidelines. Sitework contractor shall provide all necessary erosion control as part of this contract at no additional cost.
12. Sitework contractor shall investigate site prior to submitting a bid to familiarize themselves with current conditions and to provide a complete and accurate bid. Sitework contractor shall verify extent of work required such as tree clearing, removal of site components, etc. and shall include in their bid price all labor and material necessary to complete these items of work as necessary to complete the project at no additional cost.
13. Protect inlets as shown, both inside and outside of limit of work lines shown on drawings.
14. Fontaine Bros. shall coordinate and direct work related to roadway construction inside and outside of the project limits. Work on roadways shall be completed so as to not disturb ongoing operations within the City and may have to be completed in a separate mobilization and/or off hours. Costs to complete this work as it is possible, and without disrupting traffic to the greatest extent possible, shall be included in this subcontractor's proposal. All traffic details and police costs shall be borne by this subcontractor.
15. Sitework contractor understands that this project is being procured in phases and that underground piping to be completed by this subcontractor and other trades, including mechanical and electrical, may need to be completed out of sequence as the procurement process allows. Sitework contractor shall carry costs as necessary to complete this work when possible and shall do so using small equipment if the schedule dictates that such equipment may be necessary.
16. Sitework contractor to provide E&B, filter fabric, compacted gravel, etc for concrete sidewalks, precast school sign, benches, stone dust and other site amenities.
17. Sitework contractor shall comply with all relevant regulations in regard to blasting. No dynamite shall be stored on site. Sitework contractor shall be responsible for conducting pre-blast survey.
18. Sitework contractor shall comply with the Order of Conditions issued by the City of Worcester and shall report on and document compliance through completion.
19. Sitework contractor shall provide manpower, equipment, and materials necessary to respond to weather events prior to and while they are occurring. Site contractor shall not abandon site until authorized to do so by CM.
20. At limits of work adjacent to streets/sidewalks, provide 2 layers of erosion and sedimentation control or more as required to ensure that there is absolutely no runoff from the construction site to roadways, sidewalks etc.
21. Construct temporary drainage, sedimentation and erosion controls as required to ensure that stormwater and sedimentation is controlled within site limits. No runoff to streets or sidewalks shall be acceptable. If runoff occurs, site contractor is to clean immediately and remediate at their expense.
22. Provide temporary mounding, ramps, and paving for such activities as crane picks, and to provide clean access to and from building.
23. Protect existing features to remain including trees and monuments in such fashion as to prevent damage and decay. Engage the services of an arborist to certify that protection and maintenance of trees to remain is sufficient.
24. Comply with MA-DOT Vehicular and Non-Vehicular access permit requirements.
25. Site contractor shall salvage, store, and protect existing monuments.
26. Subcontractor shall install light pole bases as part of base bid work. Subcontractor shall work in conjunction with electrical subcontractor to complete light pole bases as

work becomes available and shall make no additional claims for compensation related to delays encountered in furnishing/installing light pole bases.

**D. Concrete**

1. Concrete subcontractor shall provide temporary power as necessary for completion of their work.
2. Concrete subcontractor shall provide a cold and hot weather concrete plans for review and approval prior to beginning work. Subcontractor shall adhere to these plans and provide labor, materials, equipment, and fuel for compliance with cold and hot weather concrete plans.
3. Concrete subcontractor shall not add water on site unless water has been specifically held back at batching plant. Subcontractor shall not add more water to mix than called for in the mix design.
4. Provide all survey and layout required to complete this scope of work from control points established by others.
5. Provide a field verification as-built survey of all footings, foundations, slab edges, embeds, columns, slab elevations, shafts, floor openings, anchor bolts, etc. at the completion of each placement sequence.
6. Provide all slab depressions, pockets, slopes, box outs, etc. Refer to architectural structural, and MEP drawings. Where conflicts occur, the more expensive detail applies, unless directed otherwise by Fontaine Bros.
7. Provide grouting for base plates, leveling plates, and elevator sill pocket assemblies, and include box outs for these items as required. Provide concrete infill after installation.
8. Contractor to clean all debris off metal decking, regardless of who created them, prior to placing concrete slab on deck. Contractor is responsible for removal of rain water from decking prior to pour.
9. Provide concrete in fill for all steel stair pans and associated landings. Assume this will require separate mobilizations. Provide, maintain, and remove temporary wood fillers in treads once the stair framing is complete. Clean out all pans and landings prior to concrete placement. Seal seams prior to placement and/or clean any drips after placement. Clean concrete from steel at all stair risers, stringers, and the underside of stairs and landings no later than 24 hours after concrete placement. Request review with the Construction Manager upon completion of this activity.
10. Contractor shall clean up and dispose of all concrete drippings from overhead pours.
11. Contractor shall designate and maintain a washout area in accordance with environmental regulations. Coordinate washout location with Construction Manager. Remove and dispose of debris resulting from washing out of concrete trucks.
12. Coordinate with Fontaine, OPM, and Testing Agency during all concrete work. Provide multiple curing boxes for test cylinders. Control temperature as necessary. Ensure field cylinders are cured per ACI requirements.
13. Furnish, erect, maintain, and dismantle any staging required in the course of subcontractor's work.
14. Provide daily cleanup to dumpster provided by CM.
15. Monitor materials testing reports (furnished by others) and verify that the concrete has reached 75% of its design strength.
16. Identify any modifications to the anchor bolts that have been submitted and approved by the structural engineer of record for the project. This letter of verification shall be provided to the Construction Manager on week prior to the commencement of steel erection. This contractor shall be responsible for any repairs due to misalignment.
17. Perform anchor bolt survey prior to steel erection.
18. Subcontractor shall be responsible for the flatness & levelness of finished slabs at time of finish floor application. Provide additional concrete and/or shoring as required

to meet the slab flatness/levelness tolerance due to deflection. FF/FL tests performed per specifications do not relieve subcontractor of responsibility for flatness of slabs at time of finish floor application. Leveling, patching, grinding and flashing required to bring floors to within flooring manufacturers' required flatness tolerance shall be performed by this subcontractor as part of the work of this contract. This includes remediation of floors due to curling and settling that occurs after FF/FL testing and prior to finish floor application. This also includes work necessary to patch/grind/level at construction joints, control joints, box outs, and other discontinuous slab conditions. All work required to meet manufacturers' required tolerances shall be performed as part of this subcontract and shall be included in subcontractor's bid price.

19. Subcontractor understands that foundations may be complete prior to mechanical coordination being complete in the building due to the early release of the concrete package. Subcontractor shall make box outs as necessary and furnish/install sleeving to allow for mechanical penetration when possible at no additional cost.
20. Subcontractor understands that underslab mechanical work cannot be guaranteed to be complete prior to steel erection and that slab work shall be performed at the convenience/discretion of Fontaine. CIP concrete subcontractor shall make no claims for additional monies as a result of sequence of underslab mechanical work/steel erection/slab placement and shall pour slabs as areas become available. Subcontractor understands that slabs may be placed in more mobilizations than is ideal for productivity in order to accelerate schedule. Subcontractor shall carry all costs for pumping and working within erected steel structure as part of base bid.
21. Provide all housekeeping pads indicated on the contract documents. Refer to MEP drawings as well as all other drawings and specifications for pad locations/requirements. Submit shop drawings for approval of pad size and location.
22. Provide all dowels and rebar required from concrete to masonry. Coordinate spacing and locations with the Masonry Contractor.
23. Provide temporary guardrails and toe boards as required by OSHA at all cast-in-place concrete walls where the top of the wall is more than four feet above grade. Remove and replace as required to complete your work. Maintain rails for the duration of concrete work.
24. Provide concrete pad for a building exterior wall mockup in a location determined by the Construction Manager.

#### **E. Masonry**

1. Furnish, erect, maintain, dismantle and remove scaffolding/lifts necessary to complete this scope of work in compliance with all OSHA requirements.
2. Provide all layout to complete this scope of work.
3. Patch and point any areas affected by anchorage of staging to building.
4. Temporary tarping, enclosure, and weather protection required to complete this scope of work shall be constructed, maintained, dismantled and removed by masonry contractor. Provide temporary heat and fuel within contained area.
5. Heating of sand, mortar, or similar shall be the responsibility of the masonry subcontractor.
6. Assemble and maintain an approved washout area.
7. Mason shall grout all HM frames, sidelights, borrowed lights etc. provided and set by others.
8. Install all loose lintels furnished by misc. metal contractor.
9. Install all inserts, sleeves, rails, anchors, hoist beams, etc. as provided by misc. metal contractor and elevator subcontractor.
10. Furnish and install through wall flashing systems installed in masonry.
11. Furnish and install all acoustical sealant and firestopping systems at the top and

bottom of exterior and interior walls as indicated and required to achieve STC and/or fire rating.

12. Provide access to staging for work of other trades.
13. Mason shall provide complete washdown of installed work. Protect windows and precast by wrapping in poly. Take special care to protect precast from acid and avoid etching/damage to precast finish.
14. Provide boxouts for all items to be installed in masonry walls including, but not limited to, MEPFP items, miscellaneous metals/steel, rough-in boxes, piping, ductwork, door hardware, specialties items, etc. Patch all boxouts following work of other trades.
15. Provide special shapes where noted on the drawings. Do not field cut shapes unless directed by the Construction Manager.
16. Provide grout at structural steel beam pockets. Include grouting of base plates at these locations.
17. Include the cost of all labor and materials to assist the testing agency in performing the required masonry testing.

#### **F. Structural Steel, Metal Decking**

1. Provide an OSHA approved two-line safety cable system at all deck penetrations and along the perimeter of the building in all locations where fall protection is required. Maintain this system. Provide additional turnbuckles at locations required by the Construction Manager to allow access for material loading on floors by other contractors. At openings, provide stanchions and anchoring that will allow perimeter work by others to be installed with the cabling system remaining in place. At roof level, provide temporary perimeter stanchions with sufficient height and additional penetrations to allow for cable height adjustment. This trade contractor is responsible for adjusting perimeter cable height to meet OSHA requirements before, during, and after roofing installation.
2. Provide preparation and steel primer in accordance with the specifications and compatible with finish coatings. Coordinate steel not to be painted as specified. Field touch up, by this subcontractor, is included in this scope of work.
3. Provide temporary power including fuel for all equipment necessary to complete this scope of work.
4. Provide all required shop testing and inspections. Field testing is by owner. Accommodate onsite testing of your work by the Owner's testing agency. This contractor shall be responsible for any costs associated with re-inspection or re-testing required due to this contractor's non-compliance.
5. Provide framed openings in steel and metal deck to accommodate mechanical, electrical, plumbing, and fire protection penetrations. Provide reinforcement of steel where necessary. Provide closure plate at metal deck where necessary. Protect all openings made by this bid package. Openings for ductwork, curbs, hatches, etc. are to be decked over until such time that the curbs, hatches, etc. are ready to be set. Include comeback operations to cut deck accordingly.
6. Provide all hoisting, staging, rigging, cranes required for this scope of work in compliance with all applicable OSHA regulations.
7. Comply with 6' tie off for all workers.
8. Provide PPE for all workers including, but not limited to, hard hats, glasses, harnesses, and vests.
9. Provide all temporary shoring and bracing as required. Remove temp bracing upon completion of shear walls, brace frames, and moment frames. Remobilize as required to complete this work.
10. Fireproofing.

#### **G. Miscellaneous Metal**

1. Provide all miscellaneous metal not integral to structural steel.
2. Provide and maintain temporary stair towers at (2) stair openings as directed by Fontaine Bros. from the time that access is necessary until all permanent stairs are installed. Temporary stair towers to comply with OSHA guidelines.
3. Provide all staging, hoisting, rigging, lifts necessary to complete work of this subcontractor.
4. Provide temporary power including fuel for all equipment necessary to complete this scope of work.
5. Cost for any fire watches required to complete work will be the responsibility of misc. metal fabrications subcontractor.
6. Coordinate with CM and subcontractors to complete scope of work related to items including, but not limited to, the following:
  - a. Pipe bollards
  - b. Barrier gates
  - c. Exterior scoreboard supports
  - d. Exterior handrails
  - e. Exterior guard rails
  - f. All lintels, anchor bolts, nuts, sleeves, required for masonry or other subcontractors.
  - g. Embeds for elevator
  - h. Ladders
  - i. Stairs
  - j. Roof Equipment Screens and supports.
  - k. Trench Drain frames and covers
  - l. Catwalks and stairs
  - m. Misc Supports
  - n. Downspout boots
  - o. Bleacher supports
  - p. Scoreboard supports
  - q. Unistrut Supports
7. Provide all required certificates and qualifications required per spec prior to starting any fabrication or installation.
8. Misc metal subcontractor shall acquire necessary welding permits, shall coordinate and pay for required fire watches, and shall furnish install maintain and remove all required fire blankets.
9. Provide all exterior guardrails, handrails, ramp rails, and similar rails at other locations as required in the contract documents. Refer to architectural, civil, and landscape drawings for requirement. Provide a complete installation including sleeving, coring, grouting, etc.
10. Provide all bolted, slotted, hung, welded or otherwise adjustable support angles including but not limited to brick relieving angles. This contractor shall come back and align the hung lintels/relieving angles and complete welding during the erection of the masonry veneer. After the adjustment is complete, this contractor shall weld the item in place. Include remobilization to perform this work.
11. Protect all surrounding work. Removal of welding splatter, metal cuttings, shavings, and other debris from adjacent surfaces is the responsibility of this contractor.
12. Field measure for all items to be installed on or between existing surfaces prior to fabrication.
13. Furnish embedded items associated with this scope of work to the concrete and masonry contractors in sufficient time to allow casting in place. This contractor shall be responsible for the cost of remedial/corrective work required due to the late delivery of embedded items.
14. Provide hoist beams for the elevator shafts. Coordinate location with elevator



contractor and masonry contractor to provide required clearance to facilitate elevator installation.

#### **H. Rough Carpentry**

1. Include all new wood blocking at windows as shown/specified. Include fire retardant wood at all locations.
2. Furnishing and installing of the in-wall blocking shall be the responsibility of the drywall contractor. Coordinate all blocking with other trades.
3. Furnish and install all roof blocking including dimensional lumber, plywood etc. at exterior roof edge, parapet walls, mechanical curbs, roof drains, roof accessories and any other place that blocking appears as part of drywall package.

#### **I. Finish Carpentry, Architectural Woodwork, Solid Surfacing Fabrications**

1. Millwork subcontractor shall provide shop drawings within 6 weeks after subcontract. Millwork subcontractor shall update and field verify dimensions as framing is completed, and shall produce millwork as soon as reasonably possible.
2. It is understood that millwork subcontractor shall store millwork off site at the direction of Fontaine Bros. until building is ready to accept installation of millwork. Millwork subcontractor shall include cost of offsite storage, in a climate-controlled space, until acceptance of millwork by Fontaine.
3. Millwork shop shall not be required to maintain AWI Certification in order to provide millwork, however Fontaine reserves the right to reject any millwork that does not represent a high-quality product.
4. Millwork shall be delivered in such a sequence as to facilitate a continuous installation, either in sequence from room to room or area by area. Millwork shop shall meet with Fontaine Bros. and millwork installer (finish carpentry subcontractor) to determine sequence and shall produce millwork in desired sequence at no extra cost.
5. Millwork subcontractor shall provide any steel supports integral to the millwork.
6. Provisions shall be made within millwork for all required electrical and data outlets. Allow access for electrical contractor to perform rough in on-site.
7. Finish carpentry subcontractor responsible for receiving, inventorying, unloading, distributing, protecting, and installing all millwork and finish carpentry materials not specifically included within casework scope of work.
8. Finish carpentry subcontractor is responsible for all layout necessary for installation.
9. Finish carpentry subcontractor responsible for receiving, inventorying along with supplier, unloading, distributing, protecting, and installing all hollow metal and wood doors, and finish hardware (except that provided by aluminum entrances trade contractor).
10. Wood blocking located within wall assemblies will be provided by the drywall contractor. All other blocking and blocking exterior to wall assemblies and required for the work of this bid package shall be provided by this contractor. If in wall blocking is required and not shown, provide detailed shop drawings identifying locations and type of blocking needed. Failure to identify needed in wall blocking and or late submittal of blocking information shall result in this bid package providing the needed blocking and associated wall repair.
11. Finish carpentry subcontractor shall provide and maintain temporary carboard protection of all finished surfaces in a manner that keeps the protection in place until final cleaning.

#### **J. Waterproofing, Dampproofing and Caulking**

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**SUPPLEMENTARY INSTRUCTIONS TO BIDDERS**

1. Provide all lifts, staging, hoisting, rigging, etc. required to complete this scope of work.
2. Work in sequence with other trades and complete work as areas become available. Subcontractor understands that multiple mobilizations will be necessary to complete envelope as work is completed and that areas such as loading docks may be completed later than others.
3. Subcontractor shall provide labor, material, equipment etc. necessary to complete all work related to mock ups and as required to complete building envelope and window testing. Subcontractor shall complete remedial work required in the event that any testing fails at no additional cost.
4. Provide all tie offs, harnesses, and safety requirements necessary to complete this scope of work.
5. Subcontractor shall complete punch list work within 2 weeks of a punch list being issued for each area of work. In the event that multiple punch lists are issued at different times for different areas of the building, subcontractor shall remobilize to complete punch lists as they become available.
6. Assist Commissioning Agent with all activities related to building envelope commissioning including completion of installation checklists, providing photographs of work in process, providing access for inspections, etc.
7. Once masonry is complete, provide a temporary barrier at the top of all cavity walls.

**K. Cement Fiber and Metal Wall Panels**

1. Provide all lifts, staging, hoisting, rigging, etc. required to complete this scope of work.
2. Provide all layout required for this work. Coordinate location of all panel joints with openings and wall mounted items to allow for required panel sizes and edge distances.
3. Furnish and install system from outside of vapor barrier to finish, including rigid insulation, metal framing, and panels.
4. Work in sequence with other trades and complete work as areas become available.
5. Provide all tie offs, harnesses, and safety requirements necessary to complete this scope of work.
6. Provide off site storage for panels until they are required on site.
7. Provide all metal closures associated with the work of this bid package and between this bid package and adjacent construction.
8. Work will require several mobilizations.

**L. Roofing and Flashing**

1. Comply with 6' tie off for all workers. In addition, install and maintain a fall protection system such as a flagging system per OSHA guidelines. Provide a minimum of 300 feet of Garlock temporary railing or equivalent located at the discretion of the construction manager. Return to the site at the request of the construction manager to remove Garlock when all trades have completed their work.
2. Install, maintain, and relocate as necessary (3) loading/receiving areas comprised of ballasted guardrails or comparable system at roof edge to be utilized by trades.
3. Furnish and install flat and tapered roofing insulation
4. Furnish and install complete roofing system including all components.
5. Furnish and install flashing, roof edge coping, parapet covers, sheet metal including gutters, downspouts, snow guards, aluminum flashing, cap flashing systems complete.
6. Remove snow and ice as necessary to continue and complete work without delay due to weather.
7. Furnish and install all roof specialties.

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**SUPPLEMENTARY INSTRUCTIONS TO BIDDERS**

8. Furnish and install prefabricated roof scuttles and elevator penthouse and louvers.
9. Install and flash mechanical equipment curbing provided by MEPFP and Kitchen contractors.
10. Furnish and install roof expansion joints.
11. The roofing subcontractor shall be responsible for their own fall protection system complying with OSHA standards and 6' fall rule.
12. Store roof material so as to protect roofing from damage and also from restricting access or egress.
13. Provide all lifts, hoisting, rigging, etc. required to complete this scope of work, except for setting of mechanical curbs via crane from truck on site.
14. Roofer must maintain a clean and safe work environment; daily cleanup of trash from roof to a dumpster provided by Fontaine is required. If roofer fails to maintain a clean and safe work environment, Fontaine reserves the right to stop work until cleanup is completed, complete work against subcontractor's account, or hold payments to subcontractor.
15. Clean roof decks prior to installation of this work. Rough cleaning and removal of materials will be provided by trade working on the deck prior to your work.
16. Roofing subcontractor shall coordinate with all trades requiring roof penetrations and provide all material and labor required to seal any penetrations required by those trades.
17. Roofing subcontractor shall include provisions within base bid to install temporary roofing at areas that roof top curbs and equipment have not been installed and shall not delay the overall scope of making the building weather tight contingent upon roof top information. It is anticipated that separate mobilizations for the installation of roof top curbs and equipment may be needed and that roofing subcontractor shall include provisions for this work.
18. Roofer shall provide provisions to temporarily secure the edge of the roof membrane until roof edge metal is installed.
19. Roofer shall take appropriate measures to protect roof during installation of System and after installation of system is complete including ensuring that foot traffic protection is provide in lieu of roof mats prior to installation of permanent roof mats.
20. Roofer shall provide and maintain fall protection system throughout the course of the project.
21. Roofer shall patch holes in roof created by installation of tie downs by other trades.
22. Assist Commissioning Agent with all activities related to building envelope commissioning including completion of installation checklists, providing photographs of work in process, providing access for inspections, etc.
23. Provide testing and inspection required by the specification. Provide inspections as required by the roofing manufacturer to achieve roof warranty.

**M. Firestopping**

1. All subcontractors shall complete firestopping and firesafing necessary to seal penetrations required within their scope of work. Subcontractors shall provide removable temporary firestopping and firesafing prior to final firestopping and firesafing.
2. There shall be one brand of firestop material for all firestopping work. The actual brand chosen shall be based upon a consensus of agreement between the successful bidders. The contractors will be required to provide fire stop systems as it applies to the individual scopes. The contractors shall also include fire stop/safe labeling and tagging each penetration or application with data including but not limited to installer, contractor, location, system used, and date. Also, the contractors shall provide data log entries for use in generating an as-built plan including location.

**N. Hollow Metal Doors and Frames, Wood Doors, Finish Hardware**

1. Provide submittals for scope of work within 2 weeks of subcontract award.
2. Wood doors to be UF Free.
3. Wood doors to include all stops for glazing. Include allowance to replace 5% of glazing stops and fasteners at no additional charge.
4. All HM frames shall be welded.
5. HM Doors, Frames, Wood Doors, Finish Hardware, shall be purchased furnish only in one complete package. Supplier shall be responsible for coordinating with installing contractors.
6. All hollow metal frames, steel, and wood doors shall be permanently marked with the door number location designation from the contract drawings. Apply markings in a non-visible, consistent location on all doors. Markings are to be applied to the bottom edge and hinge location on all frames.
7. HM frames within masonry shall be set by drywall subcontractor and grouted in by masonry subcontractor. HM frames within drywall partitions shall be installed by drywall subcontractor.
8. Wood and hollow metal doors shall be installed by finish carpentry subcontractor.
9. Finish hardware shall be installed by finish carpentry subcontractor. Finish hardware in Aluminum doors shall be install by the aluminum curtainwall/storefront contractor.
10. Installing subcontractors shall be responsible for labor associated with unloading and distributing doors, frames, hardware.
11. Prepare all doors and frames including pre-drilling, pre-cutting, raceways and reinforcing as required to receive all hardware including any electrical and or security equipment schedule.
12. Coordinate hardware schedule with architectural, electrical, and security drawings. Note any discrepancies prior to completion of submittals.
13. Hardware set and door opening numbers shall be marked on each individual box and on delivery slips. Provide hardware in original containers within individual hardware set boxes whenever possible. All hardware shall be prepared for proper door swing and handing. Hardware for aluminum doors shall be coordinated with and supplied to the installing contractor.
14. Supplier responsible for providing doors, frames, hardware shall be responsible for having a qualified representative on site to participate in inventorying doors, frames, and hardware as they arrive. Installing subcontractors shall take possession of materials and shall sign off on materials as they are delivered.
15. Review schedule and coordinate all deliveries with the Construction Manager. Plan on phased deliveries by floor and/or area as directed by the CM. Masonry frames will be released early and ahead of other areas.
16. Cleanly cut, remove and dispose of spreader at HM frames at direction of Fontaine Bros. Frames damaged during removal of spreader shall be replaced at no added cost by subcontractor responsible for damaging frames.
17. Provide fully tagged and labeled key cabinet set up for turnover to the owner. Provide a minimum of one full day of owner orientation training to the keying system.

**O. Metal Windows, Aluminum-Framed Storefronts, Glazed Aluminum Curtain Walls, Aluminum Windows, Glazing**

1. Provide all lifts, hoisting, staging, rigging, etc. required to complete this scope of work.
2. Subcontractor to furnish and install any and all hardware to be installed within this scope of work.
3. Subcontractor to furnish and install all flashing, panning, sealants, minimally expanding foam, and exterior sealants required for complete weather tight installation

of systems.

4. Include provisions for testing of windows in place and in mock up as indicated in specifications.
5. Work in harmony with other trades responsible for wiring doors for security, providing light fixtures within systems, and all other work that requires coordination between trades.
6. Provide final cleaning of the exterior of all systems installed by this subcontractor at the completion of the project when directed by Fontaine Bros.
7. The requirements shall apply to all subcontractors performing work of these sections, regardless of how they are procured.

**P. Access Doors & Panels**

1. Access doors and panels shall be provided by subcontractor whose work requires them for access. Location of all access doors and panels shall be noted in the coordination drawings and submitted for approval by the design team.
2. Access doors and panels shall be installed by subcontractor whose finish work the panels rest in i.e. drywall subcontractor in gypsum board partitions and gyp board ceilings, mason within CMU walls, and ceiling contractor within ACT Ceilings.
3. Access panel supplier is responsible for providing sizes and locations for installing subcontractor within 4 weeks of contract award. Subcontractor shall email a list of panels with size and locations to CM for distribution. Costs associated with rework of framing due to failure to provide correct size and location shall be borne by the subcontractor responsible for providing the doors and panels.

**Q. Coiling Counter Doors, OH Coiling Doors, OH Coiling Grilles**

1. Subcontractor shall provide shop drawings, in electronic format, via Procore.
2. Subcontractor shall provide all lifts, staging, hoists, rigging, unloading, and distribution for this section.
3. Subcontractor shall work in harmony with other trades providing components of complete system. Subcontractor shall provide shop drawings within 4 weeks of subcontract to allow for coordination with subcontractor providing blocking, electrician providing power and wiring, etc.
4. Electrical subcontractor shall furnish and install all low voltage wiring for complete operation.
5. Provide access doors and panels as necessary to service motorized components. Coordinate location with the drywall and/or masonry contractor.

**R. Drywall**

1. Furnish/Install all wood blocking within the building as required for the project including but not limited to the items listed in the specifications. This blocking includes in wall blocking, window blocking, plywood backup for mounting and associated blocking, and other blocking as necessary.
2. Comply with all **LEED** requirements including protection of absorptive materials; provide date stamped photos documenting compliance with these requirements.
3. Furnish and install ALL sheathing at exterior walls, including parapet sheathing.
4. Furnish and install ALL gypsum board assemblies, complete.
5. Subcontractor responsible for furnishing, delivering, unloading, dispersing, protecting, and installing all components of system within scope of work.
6. Subcontractor responsible for hoists, lifts, rigging, etc. required to complete scope of work.
7. Drywall subcontractor responsible for unloading, distributing, and installing HM

- frames within metal stud partitions. Install per manufacturer's instructions.
8. Patch holes in partitions created or left open for temp systems including electric, water, propane, etc.
  9. Drywall subcontractor responsible for unloading, distributing, and setting HM frames within masonry wall. Masonry subcontractor responsible for final installation/grouting of frames. Provide Styrofoam within jambs as necessary to allow for mounting of hardware on door frames.
  10. Remove and replace perimeter protection cable system as necessary to access your work. Provide additional protection as required by OSHA and the project safety plan during your operations.
  11. Upon completion of steel erection, maintain perimeter safety cable until cable is no longer needed. At that time, in coordination with the Construction Manager, this contractor shall remove and dispose of the safety cable stanchions and cables. Concrete shall be chipped as necessary by this contractor to allow stanchions to be cut below the level of the finished floor.
  12. Provide all field engineering for layout from control points provided by the construction manager. This contractor shall permanently mark all floors with wall locations and all door openings within the walls prior to erection of walls to allow layout and rough in by other trades. Permanent markings shall be confined to areas that will be covered by the wall construction. No markings may extend into areas where the floor finish is sealed concrete.
  13. Drywall subcontractor is responsible for all acoustical sealant to meet STC ratings. Provide acoustical sealing of all penetrations through gypsum walls as required to meet detailed STC ratings.
  14. Provide all firestopping and fire safing assemblies for this bid package at all walls noted as fire rated. Provide all head of wall firestopping, where required, at interior gypsum wall assemblies. Fire stopping within MEPFP sleeves/penetrations are by the trade whose work passes through the sleeve. Inspect and label all partitions with the appropriate UL label. Advise the construction manager of discrepancies found that would impact the rating of the system.

#### **S. Louvers & Vents**

1. Furnish and install work included in this section.
2. Subcontractors shall provide all lifts, staging, hoists, rigging, unloading, distribution for their work within this section.
3. Electrical subcontractor shall coordinate with louver supplier/installer to provide all necessary wiring and connections. Controls subcontractor shall furnish/install any required controls for mechanically operated louvers and vents.

#### **T. Tile, Ceramic Tiling, Quarry Tiling**

1. Provide shop drawings in electronic format via Procore. Clearly indicate areas where slab needs to be depressed and required slab depression.
2. Level, patch, clean, detail, or otherwise prepare substrate as necessary to ensure proper adhesion and finish prior to commencing installation. Fill and prepare slab shrinkage cracks and joints for floor finishes.
3. Subcontractor responsible for ensuring a smooth and level transition between various flooring types through flash-patching, reducers, transition strips, and/or any other means necessary.
4. Provide offsite storage for materials as necessary and directed by Fontaine Bros.
5. Coordinate with other subcontractors to ensure a neat and flush interface.
6. Adhere to temporary protection and cleaning instructions per specifications.
7. Protect and maintain protection of all finished work.
8. Inspect substrate of floors and wall as soon as they become available and with

sufficient time to allow for repair without impacting project schedule. Notify the CM of any discrepancies.

9. Work will be performed out of sequence. Multiple mobilizations will be required.

#### **U. Acoustical Ceilings**

1. Subcontractor shall include provisions to install ceiling grid system prior to installation of tile. Subcontractor shall carry multiple mobilizations to complete cuts, device installation, and full tiles.
2. Subcontractor shall provide multiple crews if necessary to complete installation of grid and tiles in an expedient manner. Subcontractor understands that sequence of work for acoustical ceilings will not necessarily be contiguous and that compliance with project schedule will require multiple mobilizations and may require overtime.
3. Ceiling grid shall be seismically braced as indicated or required to meet or exceed specifications and code.
4. Subcontractor to frame to and provide cutouts in the ceiling for other trades including lighting fixtures, mechanical equipment, projection screens, access panels, expansion joints, and more.
5. Provide touch up paint at cut ceiling tile edges exposed to view.
6. Subcontractor to include an allowance of 80 hours of punch list work completed for areas not damaged by ACT contractor including replacement of tiles around devices, cuts, etc. Subcontractor shall carry, in addition to labor, 40 boxes of various types of ACT to be used in completion of punch list for work NOT damaged by ACT subcontractor.
7. As a result of the coordination process, reflected ceiling plans may vary from original contract documents (light fixtures, diffusers, etc.). Attend and participate in the overhead coordination meetings. Participation in these meetings includes sign off on MEP coordination drawings. Adjustments to the ceiling assemblies to address layout of overhead equipment will be at no additional cost to the project.

#### **V. Wood Strip and Plank Flooring, Wood Athletic Flooring**

1. Subcontractor shall level, patch, clean, detail or otherwise prepare substrate to achieve proper flatness and levelness required by flooring manufacturer prior to commencing installation.
2. Provide and maintain ventilation as required to complete your work.
3. Provide gym floor line striping plan with submittals. Mobilize early to layout all sleeves as soon as gym equipment is in place.

#### **W. Resilient Flooring, Resilient Base and Accessories**

1. Provide resilient base at all areas indicated on contract documents.
2. Provide resilient tile at areas indicated on contract documents and in patterns indicated in finish schedule/drawings. In the event of a conflict between drawings and finish schedule, subcontractor shall carry more expensive pattern/quantity.
3. Level, patch, clean, detail, or otherwise prepare substrate as necessary to ensure proper adhesion and finish prior to commencing installation. Inspect substrate as soon as it becomes available.
4. Subcontractor responsible for furnishing, delivering, unloading, distributing and installing flooring materials.
5. Subcontractor responsible for ensuring a smooth and level transition between various flooring types through flash-patching, reducers, transition strips, and/or any other means necessary.
6. Install and maintain temporary protection of all finished surfaces. Adhere to cleaning

instructions per specifications, damage incurred as a result of lack of protection will be the responsibility of flooring subcontractor.

**X. Rubber Flooring**

1. Level, patch, clean, detail, or otherwise prepare substrate as necessary to ensure proper adhesion and finish prior to commencing installation.
2. Subcontractor responsible for furnishing, delivering, unloading, distributing, and installing flooring materials.
3. Subcontractor responsible for ensuring a smooth and level transition between various flooring types through flash-patching, reducers, transition strips, and/or any other means necessary.
4. Install and maintain temporary protection of all finished surfaces. Adhere to cleaning instructions per specifications, damage incurred as a result of lack of protection will be the responsibility of flooring subcontractor.

**Y. Carpeting**

1. Level, patch, clean, detail, or otherwise prepare substrate as necessary to ensure proper adhesion and finish prior to commencing installation.
2. Subcontractor responsible for furnishing, delivering, unloading, distributing and installing flooring materials.
3. Subcontractor responsible for ensuring a smooth and level transition between various flooring types through flash-patching, reducers, transition strips, and/or any other means necessary.
4. Adhere to temporary protection and cleaning instructions per specifications, damage incurred as a result of lack of protection will be the responsibility of flooring subcontractor.

**Z. Tile Carpeting**

1. Level, patch, clean, detail, or otherwise prepare substrate as necessary to ensure proper adhesion and finish prior to commencing installation.
2. Subcontractor responsible for furnishing, delivering, unloading, distributing and installing flooring materials.
3. Subcontractor responsible for ensuring a smooth and level transition between various flooring types through flash-patching, reducers, transition strips, and/or any other means necessary.
4. Adhere to temporary protection and cleaning instructions per specifications, damage incurred as a result of lack of protection will be the responsibility of flooring subcontractor.

**AA. Fabric Wrapped Panels**

1. Subcontractor shall coordinate blocking with installing subcontractor. Subcontractor shall provide locations and size of blocking required. Blocking that is installed after wallboard is installed because of Fabric Wrapped Panels sub error shall be furnished and installed by Fabric Wrapped Panels subcontractor. Patching and painting as necessary shall be charged to fabric wrapped panels subcontractor.
2. Subcontractor shall provide all cutouts in panels for wall mounted devices.

**BB. Acoustical Insulation**



1. Comply with LEED requirements including protection of absorptive materials and acoustical requirements. Provide date stamped photo documentation showing absorptive materials protected.

#### **CC.Painting**

1. Furnish and apply paint for interior and exterior surfaces.
2. Inspect and accept substrate prior to painting as soon as it becomes available. Notify the CM of any areas that do not meet specifications.
3. Provide surface preparation prior to applying paint, including field primer if necessary at hollow metal door frames.
4. Seal tops and bottoms of wood doors as required.
5. Fire rated labels shall not be painted or covered.
6. Protect surfaces not scheduled to receive paint from paint, including overspray. Paint on surfaces not scheduled to receive paint shall be removed by this subcontractor, using methods that do not damage the intended finish of such surfaces, at no additional cost to the project.
7. Properly dispose of excess materials and containers. Materials and containers that cannot be disposed of in general debris dumpsters shall be disposed of by the painting subcontractor. Create and maintain an approved washout area.
8. Paint/touch up areas where holes were created by temporary systems including temp electricity, water, propane, etc.
9. Include provisions for touchup of finish painted surfaces just prior to occupancy as directed by Fontaine.
10. Paint all access panels installed by other trades.
11. Provide stencils above ceiling at all fire rated walls.

#### **DD.Markerboards**

1. Provide off site storage for markerboards until directed to install by Fontaine.
2. Assume that separate mobilizations will be required to install mounting clips and to install markerboards.
3. Subcontractor responsible for furnishing, delivering, unloading, inventorying, distributing and installing markerboards under this scope.
4. Coordinate marker board requirements with requirements of the projection system.

#### **EE. Toilet Compartments**

1. Indicate on shop drawings all locations of in-wall blocking required for installation by others.
2. Field verify all dimensions when drywall is installed and prior to ordering material.
3. Include all fasteners, joint sealants, adhesives required to complete this work.
4. Do not damage tile finishes in the process of installation. Damage caused by installing subcontractor shall be repaired at installing subcontractor's expense.

#### **FF. Metal Lockers**

1. Metal lockers subcontractor shall be responsible for furnishing, delivering, unloading, inventorying, distributing, and installing metal lockers including fasteners, sloped tops, number tags, and hardware.
2. Metal lockers subcontractor is responsible for protecting metal lockers on site prior to installation. If necessary, store metal lockers offsite until just prior to installation. No claims shall be made for damage to metal lockers occurring prior to installation.

**GG. Kitchen Equipment**

1. Kitchen equipment subcontractor shall complete all required connections, testing, and work required to furnish and install a complete and operational system unless such work is explicitly specified as by others.
2. Kitchen equipment subcontractor shall submit shop drawings through Procore. Shop drawings shall include "rough-in" drawings. Roughing-in contractors will not be responsible for interpreting catalog cuts to determine the rough-in requirements. Indicate on shop drawings all required in-wall blocking and all floor recesses for installation by others.
3. Field measure for all critical fit custom fabricated items.
4. All equipment provided shall be installed by this Contractor. Provide all assembly of internal components to make kitchen equipment complete. Final utility connections only will be provided by others as outlined in the plans and specifications.
5. Check equipment sizes and take note to building access. Make provisions to ensure that equipment will fit through permanent doorways and/or structure.
6. Be advised that the MEPFP drawings along with the food service equipment specifications and drawings will be used as a reference for rough-in of waste, water, and electrical systems. Provide equipment to fit these requirements. Notify the Construction Manager if writing of any deviations at bid time.
7. Provide protection of equipment until final acceptance. Provide touchup painting of all finishes including factory finished equipment. Provide final cleaning of all materials and equipment. Food service equipment is required to be cleaned and sanitized by this contractor when directed by the CM.
8. Warranty periods for equipment of this bid package shall not start any earlier than July 1, 2021.
9. Participate in health department review, acceptance, and sign off.

**HH. Gym Equipment**

1. Submit receive approval, and deliver equipment and material so as to maintain the project schedule as directed by the Construction Manager
2. This contractor shall provide all switches, controllers, and necessary wiring from the controller/switch to the motors for the equipment. Power to controller/switch will be provided by the electrical contractor. Coordinate work with the electrical contractor.
3. Coordinate locations of all wall devices with the architectural drawings.
4. Provide all means of support and attachments for all equipment back to the structure. Provide all miscellaneous steel supports which are not shown on the drawings but are required to complete the work of this bid package. Include primer and touch-up paint on prefinished materials.
5. Submit complete coordination drawings in conjunction with BIM coordination indicating location of equipment in relation to MEPFP equipment, fixtures, and partition assemblies.
6. Provide and coordinate all required wall pad cut outs for wall mounted devices and signage.

**II. Theatrical Rigging**

1. Submit receive approval, and deliver equipment and material so as to maintain the project schedule as directed by the Construction Manager
2. This contractor shall provide all switches, controllers, and necessary wiring from the controller/switch to the motors for the equipment. Power to controller/switch will be provided by the electrical contractor. Coordinate work with the electrical contractor.
3. Coordinate locations of all wall devices with the architectural drawings.
4. Provide all means of support and attachments for all equipment back to the structure. Provide all miscellaneous steel supports which are not shown on the drawings but

are required to complete the work of this bid package. Include primer and touch-up paint on prefinished materials.

5. Submit complete coordination drawings in conjunction with BIM coordination indicating location of equipment in relation to MEPFP equipment, fixtures, and partition assemblies.

#### **JJ. Elevator**

1. Subcontractor shall include an allowance of (60) hours of operator time for each elevator for miscellaneous trades to complete associated work within elevator shaft. Subcontractor shall track time spent against this allowance in conjunction with Fontaine Superintendent and shall have slips signed each day reflecting time spent. Subcontractor shall be compensated or provide a credit upon project closeout based upon amount of this allowance used.
2. Subcontractor shall perform all activities related to elevator testing and commissioning as part of this scope of work at no extra charge. These activities include providing labor as required for alarm testing, elevator louver testing, and inspections.
3. Subcontractor shall include removal of all components not necessary for operation of elevator upon completion of installation including excess hydraulic oil if directed by the CM.
4. Subcontractor shall participate in and sign off on elevator room layout. Subcontractor shall make diligent efforts to avoid conflicts with other trades.
5. Include provisions for temporary power connections to operate cab during installation.
6. Subcontractor's employees shall maintain the guardrail system put in place by others during performance of their work. Subcontractors shall remove guardrails only as necessary to provide access to cab/shaft and shall replace guardrails immediately when possible. Subcontractors employees who create a safety hazard at any time will be immediately dismissed from the project.
7. Subcontractor shall make all efforts necessary to complete installation and inspection of elevator as quickly as possible to allow for temporary and permanent operation. Subcontractor shall allow temporary use of elevator with operator as feasible and shall allow use of elevator immediately after inspection regardless of whether or not substantial completion has been reached.
8. Subcontractor shall make provisions to provide specified warranty period from date of certification of occupancy or acceptance of the building, whichever is later, including provisions to provide extended warranties if necessary.
9. Provide all drawings and documentation required for inspections in a timely manner so they can be reviewed and stamped by the design team prior to elevator inspection.

#### **KK. Fire Protection**

1. Pre-install hangers prior to fireproofing.
2. Maintain as built drawings in the most recent version of AutoCAD, updated as-built drawings shall be a prerequisite to monthly payment.
3. Provide sleeves/coring as necessary for work of this subcontractor, provide firestopping through fire rated partitions. Provide acoustical sealant at all acoustical partitions.
4. All bidders are directed to review all disciplines of the bid documents prior to submitting a price. The drawings and specifications are complimentary and bidders' prices shall reflect all Fire Protection work regardless of where it is shown in the documents.
5. Furnish and install seismic bracing as required by codes and shown on drawings,

whichever is more stringent.

6. Subcontractor shall complete all commissioning and start up procedures in accordance with the specifications and as directed by the project team.
7. Fire protection contractor shall arrange for all inspections and tests, including pressure tests as required by applicable codes and engineers. Fire protection contractor shall notify Fontaine Bros. in advance of any such test and shall provide written documentation of all test performed.
8. Subcontractor shall comply with Engineer's requirements in regards to raising of fire protection piping as far above ceiling as possible at no additional cost.
9. Fire protection systems installed under this subcontract shall continue to 10 feet beyond the building perimeter. This contractor shall oversee installation of exterior fire protection system components by the site contractor as required by code.

#### **LL. Plumbing**

1. Pre-install hangers prior to fireproofing.
2. Maintain as built drawings in the most recent version of AutoCAD, updated as built drawings shall be a prerequisite to monthly payment.
3. Plumbing systems installed under this subcontract shall continue to 10 feet beyond the building perimeter.
4. Plumbing subcontractor shall include all drilling, coring, and sleeving required for this scope of work.
5. Subcontractor shall provide firestopping at all penetrations through fire rated systems and acoustical sealant at all acoustical systems.
6. Furnish and install seismic bracing as required by codes and shown on drawings, whichever is more stringent.
7. Subcontractor shall complete all commissioning and start up procedures in accordance with the specifications and as directed by the project team.
8. Plumbing contractor shall arrange for all inspections and tests, including line tests, as required by applicable codes and engineers. Plumbing subcontractor shall notify Fontaine Bros. in advance of any such test and shall provide written documentation of all tests performed.
9. Provide submittals for any materials on or penetrating the roof within 2 week of notice of intent.
10. Pressure test all lines. All testing shall be witnessed by Fontaine Bros and inspector. Provide written documentation of each test performed.
11. Protect floor drains until building has been turned over to the owner. ALL damage to floor drains will be repaired by and at the cost of the plumbing subcontractor regardless of the cause.
12. Provide all labor, equipment, and material necessary to provide temporary gas piping from LP Gas tanks provided by others outside of the building to temp heat units inside the building. Assume that there will be (5) LP gas tanks piped to a total of (5) temp heat units.
13. Furnish and install plumbing utility connections to food service equipment, including but not limited to LP, gas, sanitary waste and venting. Provide manpower to assist/work with Fontaine and Food Service equipment vendors and manufacturer's representatives to start up and commission all kitchen equipment as well as commission life safety systems.
14. Provide coring/sleeving for any work penetrating foundation walls and slabs after installation of foundation walls and slabs.
15. All bidders are directed to review all disciplines of the bid documents prior to submitting a price. The drawings and specifications are complimentary and bidders' prices shall reflect all plumbing work not explicitly included in another scope of work, regardless of where it is shown on the documents.

16. Cut metal deck penetrations at framed openings in coordination with Fontaine schedule.

**MM. HVAC**

17. Preinstall hangers prior to fireproofing.
18. Maintain as built drawings in the most recent version of AutoCAD, updated as built drawings shall be a prerequisite to monthly payment.
19. Furnish and install seismic bracing as required by codes and shown on drawings, whichever is more stringent.
20. Provide submittals for roof top units, air handlers, and other roof top units within 2 weeks of notice of intent. Provide resubmittals on this material within 1 week of returned submittal.
21. Mechanical equipment shall be procured as quickly as possible, and shall be stored off site if necessary until required for installation.
22. Comply with IAQ Management Plan, protection of ductwork, and all other **LEED** requirements.
23. Provide for full building flushout per **LEED** requirements including filter change and documentation.
24. Include construction filters and media protection for use of mechanical system during construction including filter/media changes as required.
25. Subcontractor shall provide coring/drilling/sleeving for any work associated with HVAC scope.
26. Subcontractor shall complete all commissioning and start up procedures in accordance with the specifications and as directed by the project team.
27. Furnish access panels required to access work of HVAC subcontractor, install by installer within whose finish surface they rest.
28. Subcontractor shall provide firestopping at all penetrations through fire rated systems and acoustical sealant at all acoustical systems.
29. Furnish and install all louvers on the project, including louvers connected to HVAC equipment, architectural louvers, elevator louvers, etc.
30. Provide all hoisting, staging, lifts, rigging, etc. required to complete this scope of work, including crane for setting of mechanical curbs on roof.
31. All bidders are directed to review all disciplines of the bid documents prior to submitting a price. The drawings and specifications are complimentary and bidders' prices shall reflect all HVAC work not explicitly included in another scope of work, regardless of where it is shown on the documents.
32. HVAC subcontractor shall ensure that HVAC system is fully operational prior to installation of millwork and casework as dictated by project schedule. HVAC subcontractor shall include provisions necessary to operate system during construction and deliver a fully operational and cleaned out system for occupancy including necessary filter changes etc. In the event that HVAC subcontractor fails to provide a fully operational system prior to installation of millwork and casework, HVAC subcontractor shall provide dehumidification, humidification, and temperature control to ensure that building environment meets standards within those specs.
33. Cut metal deck penetrations at framed openings in coordination with Fontaine schedule.
34. Deliver roof top equipment over multiple mobilizations as required by schedule and as coordinated with the CM.

**NN. Electrical**

1. Pre-install hangers prior to fireproofing.
2. Maintain as built drawings in the most recent version of AutoCAD, updated as built drawings shall be a prerequisite to monthly payment.
3. Furnish and install seismic bracing as required by codes and shown on drawings, whichever is more stringent.
4. Provide all submittals within four weeks of execution of subcontract
5. Subcontractor is responsible for furnishing all access panels required to access work of this subcontract. Access panels shall be installed by subcontractor within whose finished surface they rest.
6. Subcontractor shall provide temporary power
  - a. Subcontractor shall provide temporary power within building footprint and within 50 feet of perimeter of building footprint for all trades. Subcontractor shall provide power per OSHA standards within one week of notice of intent to award subcontract. Subcontractor shall provide temporary power by any means necessary, **including providing generators and fuel**. Subcontractor shall replace generators and fuel with temporary power connection from utility as soon as possible.
  - b. Subcontractor shall provide all pads, bollards, and other accessories required for temporary and permanent power provision. Subcontractor shall provide excavation, backfill, conduit, and concrete if necessary for encasement of temporary power.
  - c. Subcontractor shall provide connections to CM trailer as well as OPM/Owner trailer/office as part of bid. It is understood that these facilities may be moved during the construction period, and that these relocations will be performed at no additional cost. Power provided to CM and Owner trailers/offices shall be sufficient to power everyday operations including operation of computers, copiers, printers, and heating equipment integral to trailers/offices.
  - d. Subcontractor shall provide temporary lighting and power system within the building per OSHA requirements or specification requirements, whichever is more significant. Subcontractor shall maintain system until directed to remove system by Fontaine Bros. and shall not remove temporary system until permanent systems are in place. Subcontractor shall include dismantling system safely and without further damage to installed finishes around system. Subcontractors whose system runs through shall include provisions for patching holes left by system, painter shall include painting patches.
  - e. Subcontractor shall provide wiring to temporary heating equipment provided by Fontaine Bros, including special connections, and disconnections, as part of base bid.
7. Subcontractor shall provide labor, material, and connections to provide power to all systems requiring power shown on plans, even if wiring is not specifically shown on the electrical plans.
8. Subcontractor shall furnish and install low voltage wiring as required for window shades, gymnasium equipment, curtain and rigging, food service equipment, overhead doors and controls, and similar equipment furnished and installed by others that requires low voltage wiring to and from controls or at other connection points.
9. Furnish and install site electrical, including, but not limited to feeders, conduit, supports, and equipment. Excavation and backfill by others. Coordinate with sitework subcontractor.
10. Subcontractor responsible for all precast and prefabricated equipment pads related to Electrical work.
11. Schedule testing and inspections expeditiously and in advance of required contract dates. Coordinate with Fontaine field personnel.
12. Provide coring/drilling/sleeving at penetrations required for electrical work.

13. Subcontractor shall provide firestopping at all penetrations through fire rated systems and acoustical sealant at all acoustical systems.
14. Subcontractor shall complete all commissioning and start up procedures in accordance with the specifications and as directed by the project team.
15. Provide coring/sleeving for any work penetrating foundation walls and slabs after installation of foundation walls and slabs.
16. Subcontractor shall include in their bid provision of labor, material, and equipment necessary to make special connections for equipment requiring special power such as floor grinding machines, masonry saws, dehumidifiers, fans, etc.
17. Provide labor, equipment, and material necessary for connection and operation of temporary heating systems during winter of 2019-2021. Remove and dispose of materials when directed by Fontaine Bros.
18. All bidders are directed to review all disciplines of the bid documents prior to submitting a price. The drawings and specifications are complimentary and bidders' prices shall reflect all Electrical work not explicitly included in another scope of work, regardless of where it is shown on the documents.
19. Cut metal deck penetrations at framed openings in coordination with Fontaine schedule.
20. Commissioning and testing.

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Document 00 73 00a  
BIM EXECUTION PLAN

## **BIM Execution Plan and BIM Requirements for Subcontractors**

### **1 Introduction**

In the past years, Building Information Models (BIM) have evolved from being a specialty application that was primarily used on process industry projects to an accepted and valued tool in the general building industry. BIM for building projects has demonstrated its value to construction practitioners on the design and construction side. BIM representing design or shop drawing information in three dimensions has proven to be a beneficial tool for representing, sharing and coordinating information among the participants of a project. In addition to 3D geometrical information BIM can also contain information that is associated with building elements, spaces or buildings in general e.g. schedule information, cost information, status information, submittal information etc. At this time, BIM is still an evolving topic in our industry that will keep expanding in its use and application. While there are many aspects of BIM that are new and are in the process of being defined, other areas, such as 3D coordination of disciplines and trades, have already proven their value. To date the overwhelming majority of projects that use BIM for discipline and trade coordination, report a higher degree of accuracy and reliability of the coordination effort. This higher degree of coordination translates into reduced re-work in the field. In a secondary effect the high level of coordination and trust in the coordination effort often results in subcontractors feeling confident to raise their level of pre-fabrication on BIM projects and hence generate savings through more efficient fabrication practices. While Fontaine Bros. cannot guarantee or prescribe any certain level of trust and pre-fabrication to happen on the project, we are committed to creating an environment in which the project participants provide the best of their work product to our client and at the same time work efficiently and profitably. It is Fontaine Bros. intent to leverage the practical, tried and proven aspects of BIM to their greatest extent. At the same time, it is not Fontaine Bros. intent to use every possible facet of BIM without seeing a clear benefit for the project. The intention of this document is to provide clarity about Fontaine Bros. BIM Process and the requirements for participating in that process.

### **2 The BIM Based Trade Coordination Process**

#### **2.1 Modeling requirements for subcontractors**

On the project Fontaine Bros. will implement a collaborative BIM Process for the coordination of the trades specified in Section 8 in this document. The purpose of the coordination effort is to reach agreement on the usage of space for components installed by the different subcontractors, access space and clearance space. In this coordination process the subcontractors are required to provide models, called Component Models, for the scope of their work. Section 8 provides the minimum requirements for the objects that need to be represented in the Component Models of the respective subcontractors. The subcontractors are encouraged to represent all objects and space requirements in the model that they deem necessary to coordinate their scope of work with the other trades. The subcontractors may use reasonable abstractions for representing the objects and elements of their scope of work, e.g. box representations for cable trays and light fixtures. The abstractions must be appropriate to allow meaningful interpretation and coordination between the trades.

#### **2.2 Structuring the models**

The Component Models need to be broken down into areas that can be shown on drawings and that correspond with the general sequence of the coordination process with each of these Component Models being represented in one file. For a 10 story hospital, for instance, the models, and files, provided by the subcontractors are broken down by trades and levels. If the facility has a larger footprint the Component

Models will be structured by trades, levels and zones. The practice of breaking down a model by different trades, levels and zones serves multiple purposes: (1) the general sequence of the coordination process can be followed in which the team breaks up the building into different areas, coordinates these areas and signs-off on the coordination of these areas; (2) the models provided by the different project participants are distinct so no two subcontractors need to work on the same model or file and their contributions can be clearly delineated; and (3) the file sizes of the Component Models remain small and manageable for all project participants. The file structure of the Component Models will be determined in the BIM Kick-off Meeting. Please see the example provided in Section 4.

### 2.3 Models are a contract for installation space

For the purpose of field installation the signed off, final models are treated as a contract for space. By modeling their components and their scope of work, including access space etc. subcontractors reserve space. If a conflict arises in the field installation the subcontractor who did not reserve space for his/her components has to move his/her components for the subcontractor who did reserve space at his (the subcontractor who did not reserve space) cost. The subcontractor who did not follow the model also has to compensate other contractors/subcontractors for consequential costs arising from the incorrect installation of his/her components. Components that are not represented in the model will be installed after the components that are represented in the signed-off model.

### 2.4 The modeling and coordination sequence

The sequence and schedule of the coordination is determined by Fontaine Bros. Project Manager on the project. All models and drawings shall be developed in the time frames allotted and submitted so as to not delay the installation of the overall project schedule. In general, the traditional sequence of coordination (Structural Fabrication, Ductwork, Pitched Pipe, Pressure Pipe, Electrical, Fire Protection) will be followed. Exceptions to this sequence may be necessary. The coordination effort for each of the areas will start with a high level overview meeting in which high level agreements between the different trades are reached. These agreements may include: general elevation levels for the installation of the different trades, constraints around vertical riser cores, general agreements on the standard cross sections in corridors etc.

### 2.5 The model sharing, clash detection and coordination process

Figure 1 illustrates the BIM-Based Coordination Process. The process starts with the designers or 3<sup>rd</sup> party modelers providing the architectural and structural Component Models and uploading these models to the file sharing platform. In addition 2D dwg files of the floor plans will also be made available. The Component Models will be made available to all project participants to be used as background models for laying out their scope of work. The subcontractors should use these models and the Component Models provided by the other subcontractors as reference models (x-Refs in AutoCAD based applications), so that their work is represented in a distinct file that does not contain the information provided by the other project participants. Please refer to the provisions in Section 10 (Contract Documents and the model - legal aspects) regarding the reliability of the architectural and structural Component Models.

Fontaine Bros. will make the following material available to the subcontractors on a file sharing site:

| Component                             | Author   | File Format  |
|---------------------------------------|----------|--------------|
| Architectural Model                   | Designer | 3D rvt*      |
| Structural Model                      | Designer | 3D rvt*      |
| Mechanical Floor Plans                | Designer | 2D dwg*+ pdf |
| Electrical Floor Plans                | Designer | 2D dwg*+ pdf |
| Plumbing Floor Plans                  | Designer | 2D dwg*+ pdf |
| Architectural Floor Plans             | Designer | 2D dwg*+ pdf |
| Architectural Reflected Ceiling Plans | Designer | 2D dwg*+ pdf |

|  |          |              |
|--|----------|--------------|
| Architectural Sections and Elevations  | Designer | 2D dwg*+ pdf |
| Structural Floor Plans   | Designer | 2D dwg*+ pdf |
| Structural Sections and Elevations   | Designer | 2D dwg*+ pdf |
| Others   | TBD      | TBD          |
| * Autocad (dwg) and Revit (rvt) files will be provided if appropriate model or cad files will be provided to Fontaine Bros. by the design team |          |              |

Following the agreed upon coordination sequence the subcontractors will develop the layout of their scope of work and upload their Component Models to the file sharing platform. In accordance with an agreed upon schedule Fontaine Bros. will download the latest Component Models from the file sharing platform and create a Federated Model. A Federated Model is a model that superimposes the Component Models provided by the project participants and allows delineating the Component Models from each other in the superimposed representation. The Model Review software, in which the Federated Model is created, allows automated and efficient identification of the physical clashes between the Component Models. Fontaine Bros. BIM Manager will highlight the identified clashes and conflicts in the Federated Model. That Federated Model will be made available to all project participants on the file sharing platform before the coordination meeting. The clashes identified in the Federated Model will be discussed in the coordination meeting. The subcontractors are required to bring their laptop computers with the relevant software installed on the computers to the coordination meetings so that smaller clashes can be resolved right at the coordination meeting. For clashes that require more re-modeling work a conceptual solution will be developed and documented in the coordination meeting and the subcontractors will make adjustments to their Component Models in their home offices. Fontaine Bros. may elect to use web meetings for the coordination process. The coordination process is an iterative process that typically requires weekly in-person coordination meetings. In addition to that web-based coordination meetings (2-3) per week may be conducted. If conflicts or interferences in the coordination process cannot be satisfactory resolved the Architect shall be notified for his/her decision to be obtained.

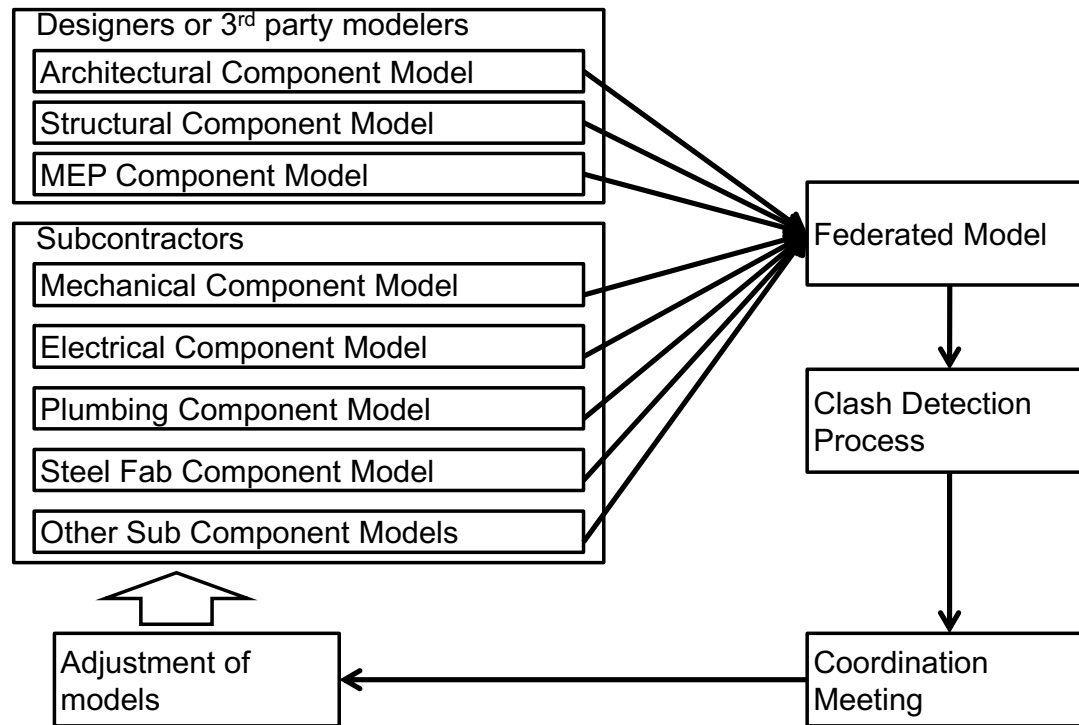


Figure 1. The BIM-Based Coordination Process (generalized version; project specific situations may be slightly different)

## 2.6 Specific Responsibilities of the Subcontractors

In the coordination process Fontaine Bros. requires the subcontractors to upload their models on a frequent basis as they are being developed to the provided file sharing platform. Uploads may be requested on a frequency between once a week and daily depending on the requirements on the project. This frequent sharing of the work as it is being developed allows the following subcontractors to make themselves familiar with the constraints on the project early and voice possible concerns before the predecessor trades finalize their work.

It is Fontaine Bros. intent to create an environment in which clashes in the models between the trades are avoided in the first place, rather than identified and resolved in an iterative process. Fontaine Bros. therefore requires the subcontractors to have a Model Review software (see section 5 of this documents) installed on their computers and perform clash tests using their own Component Models and the Component Models of the other trades that are available on the file sharing platform. These clash tests should be performed as the models are being developed, at a minimum on a daily basis. The subcontractors shall coordinate among each other via phone, through the file sharing server and by using online meeting tools to resolve as many clashes as possible before the coordination meeting.

The purpose of the modeling and coordination process is to develop a layout that works for all trades participating in the project, not just for the trades leading in the coordination process. It may therefore be necessary that portions of the model that have been developed need to be re-configured and re-coordinated. For the purpose of developing a workable solution to coordination issues that follows the design intent represented in the design documents and accommodates for the coordination constraints arising in the coordination process the subcontractors may need to develop a solution that requires additional components (e.g. pipe, fittings, elbows, hangers, cable tray etc.).

For the purpose of coordination and development of shopdrawings the design drawings created by the design team provided through Fontaine Bros. are the authoritative documents that shall be followed. It is

the responsibility of the subcontractors to check if any provided design models are in agreement with the authoritative design documents.

For each Component Model provided the respective subcontractor assumes responsibility for the constructability of the system within the spatial requirements described in the model. This includes hanging and support requirements.

Figure 1 also shows that the BIM-Based Coordination Process does not change the fundamentals of the coordination process. The design team develops the design Component Models and the sub-contractors create the shopdrawing – level Component Models. Fontaine Bros. does neither create design nor shopdrawing information. Fontaine Bros. role is to facilitate an efficient coordination process and ensure the constructability of the project.

## **2.7 Maintaining the Models and Drawings**

All subcontractors are required to install their systems in the spaces that they reserved in the model-based coordination process so that the coordinated and signed-off model becomes the AS BUILT model and the coordinated drawings become the AS BUILT drawings. If changes or adjustments become necessary, these changes or adjustments need to be represented in the respective Component Model, checked for constructability in the Federated Model and coordinated with the other subcontractors involved in the coordination effort and coordinated with Fontaine Bros. Only after Fontaine Bros. review and written approval of the updated Component Model can changes be implemented in the field. It is the subcontractor's responsibility to ensure consistency between their Component Models and drawings at any point in time.

## **2.8 Installation in the Field**

Subcontractors have to coordinate the installation sequence among each other AND with Fontaine Bros. This coordination may be required even early in the coordination process, but in any case before installation of the components in the field. Components that are not modeled will be installed after the components that are represented in the model.

## **2.9 Installation in the Field**

The design team indicated that they will make available their Design Models in Revit format. The design team states that some members of the design team are new to Revit and that they cannot make any representation regarding correctness and accuracy of the models. The authoritative contract documents are the pdf drawings issued by the design team. The design team will be available for model review sessions in order to identify and discuss area that require definition or where the design needs to be adjusted for constructability. Fontaine Bros. will moderate and facilitate the processes of collaborating with the design team and the design team has indicated interest in participating in this collaborative process, but there is no legal requirement (relative to the relationship between Fontaine Bros. and the design team) for the design team to provide particular participation or services in the process.

## **3. The Setup Process**

The setup process for BIM-Based Coordination will involve the coordinators of the project participants listed in Section 8 and will comprise the following activities:

- BIM Kick Off Meeting:
  - o Development of the coordination sequence and the coordination schedule
  - o Definition of the breakdown structure of the model into Component Models with each of the Component Models represented in one file
  - o Determination of the governing coordinate system for all model files
  - o Establishing the agreed upon origin points

- Establishing the File Naming Conventions
- Setup of the file sharing platform (done by Fontaine Bros.)
- Proof of concept of the interoperability of the different modeling systems used on the project (all participants involved)
- Training for model review and clash detection (provided by Fontaine Bros.)
- Process training and training on using the file sharing platform (provided by Fontaine Bros.)
- Development of file format exchange protocols and installation of Object Enablers

Typically, it takes up to 2 weeks after the BIM Kick-off meeting until the systems of the project participants are setup in a way so that they can efficiently exchange files.

#### **4. Modeling, Model File and Drawing File Requirements**

The subcontractors have to provide their files in a file format that is useful for the coordination team for spatial coordination. The minimum requirement for the model files are the following:

- AutoCAD 2013 \*.dwg file format with components of the subcontractor's scope represented as 3D Solids. In addition the provision of the component model files in their native file format may be requested. The use of formats other than \*.dwg needs to be coordinated with Fontaine Bros. BIM Manager.
- The coordinate system of the model(s) will be determined in the BIM Kick-off Meeting. As a default the coordinate system is the coordinate system of the structural design Component Model.
- The x,y components of model files and drawing files (e.g. for coordinated composite drawings, shop drawings and installation drawings) need to agree so that files can be superimposed in a meaningful way without adjustments to the coordinate systems. It is encouraged to make the 3D model files and the 2D drawing files one and the same file with the annotation layers turned off in the model file representation.
- The layer names of the submitted model files need to be intuitive for construction practitioners
- Access spaces and clearance spaces represented in the model need to be represented on a layer named CLEARANCE. Layers should be organized by Systems and need to be coordinated and approved by Fontaine Bros.
- Annotations have to be on layers separate from layers containing 3D geometrical information and have to be designated as annotation layers.
- The breakdown structure of the Component Models and the names of the corresponding files will be determined in the BIM Kick-off Meeting.
- The coordinate systems in the different model files provided by the subcontractor need to be coordinated with each other in a way that the models will fall into place when superimposed in NavisWorks or referenced-in in Autocad-based applications. There must be no overlap or disconnect between the components represented in different model files.
- The building elements represented in the model need to be of a granularity that corresponds with the anticipated installation sequence, so that the model can be linked to a schedule and the construction process can be simulated.

- Participants in the coordination process have to upload their respective Component Model files to the designated locations on the project file sharing platform.

## **5. Hardware and software requirements**

The requirements stated below are for the following trades:

- Structural, Mechanical, Ductwork, Plumbing, Electrical, Fire Protection, Pneumatic Tube, Controls

Requirements:

- Functional personal email address for each coordinator
- Internet connection from the office that allows general internet access, access to collaboration tools (e.g. GotoMeeting, Webex etc.) and access to the file sharing platform
- Fully functional Model Review software that can load the models and file formats specified in this document and can perform comprehensive clash detection. These Model Review software may be: Autodesk Navisworks Manage, Tekla BIM Sight (generally free software; please confirm before bidding project; <http://www.teklabimsight.com>), Solibri

## **6. BIM training and support**

Throughout the project duration Fontaine Bros. designated BIM Manager will be the direct point of contact for all subcontractors for BIM related questions. The BIM Manager will establish the protocols for efficient file sharing and hold training sessions for clash detection and for using the file sharing platform.

At the request of the contractors Fontaine Bros. can provide training and support for the model review software and the file sharing platform.

## **7. Sign Off and Coordination Drawing Requirements**

On the project it is the Sheet Metal Subcontractor's responsibility to assemble the coordinated composite drawings. Each subcontractor/trade listed in Section 8 shall provide the sheet metal subcontractor with the files in dwg-format so that he/she can assemble the coordinated composite drawings. These files must be consistent with the model files used for the model based coordination process. It is encouraged that dwg files provided for the creation of the coordinated composite drawings are the model files with the annotation layers turned on.

### **8. Minimum requirements for components represented in models and drawings:**

The requirements for objects to be included in the Component Models provided by the subcontractors are minimum requirements. The subcontractors are encouraged to provide additional objects in their models that facilitate the coordination between the trades. In case of contradictions between inclusions and exclusions in the scope description below the case that imposes the greater duty on the subcontractor shall be considered.

#### **Site Utilities:**

See respective Mechanical, Electrical and Plumbing sections of this document

#### **Structural Steel**

Inclusions: All structural steel members in their true shape and dimensions.  
Exclusions: Nuts and Bolts

#### **Miscellaneous Steel**

Inclusions: All support steel  
Exclusions: Nuts and Bolts, handrails mounted to walls (not to the floor)

#### **Mechanical Systems and Heating, Ventilation, Air Conditioning**

Inclusions: All systems included in the Mechanical Systems scope of work including but not limited to all mechanical piping, distribution, valves equipment, hanging and support systems, insulation, fittings, valves, geothermal systems.  
Exclusions:

#### **Sheet Metal**

Inclusions: All systems included in the HVAC scope of work including but not limited to all ductwork, diffusers, flex duct, VAV boxes, access space for maintenance of installed equipment, Air Handler Units, fans, pumps, tanks, control boxes and panels, heat exchanges and all components included in the subcontractor's scope that are generally relevant for space coordination.  
Exclusions: Flanges, insulation, access doors, hangers and support systems.

#### **Plumbing Systems**

Inclusions: All systems included in the plumbing scope of work, including underground lines including but not limited to pipe, pipe racks and support structures, hangers, distribution systems and equipment included in the plumbing scope of work; medical gas systems, gas, gas tanks; rain water leaders, pressure and drainage pipe  
Exclusions:

#### **Electrical Systems**

Inclusions: All systems included in the electrical scope of work, including, but not limited to all conduit in conduit racks carrying more than 3 conduits, light fixtures, required clearance space (e.g. in front of electrical panels, around light fixtures, access to electrical J-Boxes); ceiling plane, underground systems.



Receptacles, switches, junction boxes

Speakers, cameras, clocks, and similar electrical equipment. This also includes clearance and access spaces.

Exclusions: Conduit 1" and smaller if not more than 2 conduits are in the area.

#### Fire Protection Systems

Inclusions: All systems included in the Fire Protection scope of work, including but not limited to pipe, sprinkler heads, valves, fire pumps, hangers

Exclusions: none

#### Control Systems

Inclusions: All systems included in the Control Systems scope of work, required clearance space (e.g. in front of control panels)

Exclusions: Conduit 1" and smaller

#### Kitchen Equipment and Systems

Inclusions: All systems included in the Kitchen Equipment scope of work, required clearance space (e.g. in front of panels, for service and maintenance), connection points to power, water, utility lines.

Exclusions: Interior details of equipment.

#### Case Work and Mill Work

Inclusions: Case work and mill work components that are to be modeled. Case work and mill work that is accurately represented in its to be installed shape, form and location can be copied from the design model into the trade contractor's component model.

Exclusions:

#### Gym Equipment

Inclusions: All gym equipment that is attached or stationary is to be modeled. This also includes support systems, divider walls as well as clearance zones.

Exclusions:

### 9. Facility Management Related Requirements

It is the intention of the Owner and Fontaine Bros. to use the model for Facility Management related purposes. The owner and Fontaine Bros. will develop a list of elements and equipment that are of interest for Facility Management purposes. These elements are to be coded in the model with specific information.

For this reason the subcontractors are required to:

- To structure models such that elements that are of interest for Facility Management Purposes can be isolated
- Insert provided hyperlinks into these elements
- Insert specific property information into these elements

#### **10. Contract Documents and the model - legal aspects**

The models provided by the design team or 3<sup>rd</sup> party modelers and provided to the subcontractors are for information only and are not contract documents. Fontaine Bros. does not make any representation regarding completeness or fitness of models provided by the design team for the coordination process. The contract documents remain the paper or pdf versions of the design drawings provided by the design team and provided to the subcontractors. Fontaine Bros. requires coordination of the systems listed under Section 8 in BIM even though the model provided is not a contract document. It is the subcontractor's responsibility to check if the model agrees with the contract drawings and report any discrepancies and inconsistencies to Fontaine Bros.

The provided design documents do represent design intent, but are clearly not fully coordinated between disciplines and systems. In order to ensure constructability of the design the coordination process described in this document needs to be followed and implemented by relevant project participants. Deviations between the design documents and final coordinated product may need to be developed with the design team and coordinated with the design team. If these deviations are within the scope of typical coordination of comparable BIM projects the costs need to be borne by the subcontractor.

The requirement to provide coordinated and signed off drawings remains un-affected by the requirements and provisions described in this document.

The subcontractor grants a non-exclusive copyright license for the Component Models created in the modeling process to Fontaine Bros., including the right to provide or sell the model or parts of it to owner or other entities, e.g. for the use in Facility Management systems. If the model is published Fontaine Bros. or the user of the model designated by Fontaine Bros. is not required to mention the creator of the model.

#### **11. Specific Additional Requirements**

1. The Plumbing systems contractor is also to include any site utility systems related work in its scope of modeling and drawing
2. The Sheetmetal contractor is to compile composite drawings for submission to design team of the shop drawings provided by other team members.

End of Section



**Site Specific Safety Plan**  
**“The Joint Venture” / W.T. Rich**  
**A Joint Venture**  
**Construction Managers**

Date: February 2018

Project Name: Worcester South Community High School

Site Address: 170 Apricot Street Worcester, Ma 01603

Owner ; City of Worcester, MA. City Hall 455 Main Street Worcester, Ma 01608

Construction Managers; Fontaine Bros. Inc. 510 Cottage Street Springfield, Ma 01104 (413)-781-2020

W.T. Rich Company, Inc. 29 Crafts Street Newton, Ma 02458 (617)-467-6010

Owners Project Manager; Heery International 80 Blanchard Road Suite 108 Burlington, Ma 01803

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**Note: All references to “The Joint Venture” refers to Fontaine Bros. Inc. and W.T. Rich who have contractually entered into the Worcester South High School Project as a Joint Venture.**

**\*This is a Smoke-Free Project per the Massachusetts Education Reform Act. This includes cigarettes, cigars, pipes and vaping.**

**“ No Smoking” Signs will be posted throughout the project.**

## **Introduction**

Communication and training is an integral part of the program, and should be emphasized over the duration of the project. In order to facilitate the above, every employee on site shall follow the established policies and procedures, report hazardous conditions and mitigate “areas of concern” before an illness, injury, near miss or other incident is realized. Contractors as well as other persons on this site are obligated to follow the same rules and regulations that have been implemented for the contractors in accordance with the requirements of, but not limited to; the federal Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA) or other state and local agencies, and this safety program.

The goal of this program is to provide a healthy and safe working environment for everyone as well as to protect the site and the environment to the best of our ability.

## **Scope**

The Project includes, but is not limited to, a new High School constructed behind the existing South High Community School. Facade construction to be brick veneer, fiber cement panels and composite metal panels; metal stud back-up; aluminum windows and curtainwall systems; PVC roofing. Primary structural frame to be structural steel with applied fireproofing where noted. Exterior site work, play areas, parking and paving on grade are also included. Project to be phased construction, the existing school is to be demolished during the last phase.

## **Primary Requirement**

“The Joint Venture” shall make all personnel on site, including sub-contractors aware of this site-specific safety plan, and emergency action plan(s), prior to initiation of work when practical. This notification shall include; site specific program content, special project concerns and hazards, owner modifications, the training requirements for the project, including the day and time of the “tool box” talks, the reporting of hazards, illnesses, injuries and “near-misses”, any dangerous or out-of-service equipment, and the location of all the plans, manuals, SDS and JHA / JSA’s. All reports, including accidents, incidents, out-of-service equipment and other information related to this plan shall be submitted to the Project Manager/Site Superintendent for corrective action and distribution.

## Safety Vision and Guiding Principles

The management of "The Joint Venture" is very interested in working with you to provide a safe place in which to work. The prevention of accidents and injuries to employees is the prime objective.

All personnel are expected to take an active and constant interest in the prevention of accidents. We call upon all employees to use good common sense and in all their actions, take a second to think of the consequences to your fellow employees. We cannot overemphasize that all employees must do their part to minimize accidents.

Please show your support by demonstrating the following:

1. OBSERVING COMPANY SAFETY RULES.
2. KEEPING WORK AREAS FREE OF UNSAFE CONDITIONS.
3. AVOIDING AND ELIMINATING UNSAFE ACTS.
4. PROMPTLY REPORTING UNSAFE ACTS AND CONDITIONS.
5. REPORTING ALL ACCIDENTS IMMEDIATELY.

Accidents cause suffering and pain. We value each of you as individuals and hope you will cooperate with us in this important endeavor.

Any constructive criticism or suggestions toward improving safety on any of our jobs will be given prompt and careful consideration.

Sincerely,

---

*"The Joint Venture"*

## **SAFETY MISSION**

**A PRIMARY GOAL OF “THE JOINT VENTURE” IS TO ELIMINATE OR CONTROL BOTH KNOWN AND POTENTIAL SAFETY AND HEALTH HAZARDS WHICH EMPLOYEES FACE ON THE JOB.**

In order to do so, we must adhere to the following guidelines:

- Safety and Health are a shared responsibility. Everyone from top management to supervisors to each and every worker must take ownership of his/her own safety and that of co-workers.
- Maintaining a safe and healthful work environment is not just an idea, it is top priority.
- It is everyone’s job to spot hazards and to correct them or report them in a timely manner.
- Where hazards cannot be completely eliminated, they must be reduced through engineering and/or administrative controls or, as a final precaution, through the proper use of personnel protective equipment.
- Every individual will be trained to perform work safely. Should an individual feel inadequately trained to perform certain tasks, he/she shall immediately discuss the problem with his/her foreman.
- As a condition of employment, each employee must consistently work in a safe manner.

Signature:\_\_\_\_\_ Date:\_\_\_\_\_

## Code of Safe Work Practices

### Personal Protective Equipment and Project Safety Requirements

1. Hard hats are required at all times.
2. Safety glasses are strongly recommended at all times.
3. Class 2 High Visibility Clothing required at all times per latest version of ANSI 107.

“The Joint Ventures” managers and supervisors play a key role in the prevention of accidents on the job. They have direct contact with the employees and know the safety requirements for various jobs.

Safety responsibilities for these individuals include:

1. Enforce all safety rules in the Code of Safe Practices and ensure safe work procedures.
2. Verifying corrective action has been taken regarding safety hazards and accident investigations.
3. Conducting periodic documented inspections of the work sites to identify and correct unsafe actions and conditions that could cause accidents
4. To act as a leader in company safety policy and setting a good example by following all safety rules
5. Becoming familiar with local, state, and federal safety regulations. The Safety Coordinator is available for assistance
6. Train all new and existing employees in proper safety procedures and the hazards of the job
7. Instruct all employees, under their supervision, in safe work practices and job safety requirements
8. Hold weekly safety meetings with employees
9. Ensure employee proficiency when assigning work requiring specific knowledge, special operations or equipment
10. Ascertain that all machinery, equipment, and workstations are maintained in safe working condition and operate properly.
11. Correct unsafe acts and conditions that could cause accidents

12. Communicate with all employees about safety and accident prevention activities
13. Correct the cause of any accident as soon as possible
14. Ascertain that proper first aid and firefighting equipment is maintained and used when conditions warrant its use
15. Maintain good housekeeping conditions at all times
16. Investigate all injuries and accidents to determine their cause and potential corrective action
17. Ascertain that all injuries involving our employees that require medical attention are properly treated and promptly reported to the office

Every worker is responsible for working safely, both for self-protection and for protection of fellow workers. Employees must also support all company safety efforts. Specific employee safety responsibilities include:

1. If you are unsure how to do any task safely, ask your supervisor.
2. Read and abide by all requirements of the Safety Manual.
3. Know and follow the Code of Safe Practices and all company safety policies and rules.
4. Wear all required personal protective equipment.
5. Report all accidents and injuries, no matter how minor, to your supervisor immediately.
6. Do not operate any equipment you have not been trained and authorized to use.
7. Report any safety hazards or defective equipment immediately to your supervisor.
8. Do not remove, tamper with or defeat any guard, safety device or interlock.
9. Never use any equipment with inoperative or missing guards, safety devices or interlocks.
10. Never possess, or be under the influence of, alcohol or controlled substances while on the premises.
11. Never engage in horseplay or fighting.
12. Participate in, and actively support, the company safety program.

## TRAINING

**Training must be provided by competent person/qualified person and documented or “certified” as required.**

Training must be provided for all personnel, specific to the types of work being performed by same.

- Training must be provided and documented for, but shall not be limited to; Fall Protection, Fork Lifts (Powered Industrial Truck Standard), Lockout/Tag out, Personnel Lifts, Respiratory Protection, welding certifications, scaffolding etc.
- All employees must have proof of OSHA 10-Hour Training
- All persons must complete New Employee Orientation prior to the start of work or as practical.

Some training can be provided through “Tool Box” talks, training or similar. Contractors must have proof of training, which can include, but is not limited to:

- Sign-in sheets
- Quizzes
- Training can also be provided by an outside agency or company with special knowledge on the topic being covered.
- Trainer must be competent in the subject material
- Sign in sheets or quizzes can be used for record of attendance
- Trainer providing the information shall provide a copy of training documentation, including information covered

A copy of the training documentation and the accompanying rosters should be maintained by “The Joint Venture”

The Tool Box / Training Sessions for this project or site shall be held on;

*Day of the Week* at \_\_: am

## Job Hazard Analysis (JHA) or Job Safety Analysis (JSA)

A JHA or JSA shall be developed for **all non-routine activities**, as well as for major construction operations. The Analysis shall be performed by a competent person, and shall be appropriately documented.

A copy of the JHA / JSA shall be provided to "The Joint Venture" for review.

The JHA or JSA is performed to be used as an operating procedure, and shall be made available for review and training for personnel performing the identified work.

- A copy of the JHA / JSA shall remain on site.

|  |                           |  |
|--|---------------------------|--|
| <b>JOB SAFETY ANALYSIS FORM</b>  |                           |  |
| <b>Location:</b>   |                           | <b>Date:</b>   |
| <b>JOB/TASK:</b>   |                           | <b>PREPARED BY:</b>  |
| <b>CONTRACTOR:</b>   |                           | <b>REVIEWED BY:</b>  |
| <b>COMPETENT PERSONS:</b>  |                           | <b>APPROVED</b>  |
| <b>JOB STEPS</b>   | <b>POTENTIAL HAZARDS</b>  | <b>ACTION/PROCEDURE TO CONTROL OR ELIMINATE</b>                  |
| 1. Supervision by Competent Person Designated by Employer as having expertise and training, ability to recognize existing and predictable hazards and having authority to take corrective action | Existing and predictable. | Regular and frequent inspections by CP, supervision of personnel |
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## OSHA Inspections

The Occupational Safety and Health Administration is part of the U. S. Department of Labor. The OSH Act was promulgated to insure every working man and woman in the nation a safe and healthful working environment and to preserve our human resources. This said, it falls upon all of us to make sure we meet this requirement in our work places.

Our first, best line of defense is the Field Foreman, the person responsible for the day-to-day operation of a construction project. This individual is also known as the "Competent Person", meaning he is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous or dangerous to employees, AND has the authorization to take prompt corrective measure to eliminate them. The Competent Person is so designated by the employer.

The best practice for an inspection is preparedness. Following the guidelines in the manual will assist you. Here is a brief guide to the steps in an inspection. There may be some variations depending on the Compliance Officer.

NOTE: Discuss if you have questions but NEVER ARGUE with the C.O.

The Compliance Officer arrives on site and presents his credentials to the General Contractor (Prime or Construction Manager). (Now is the time for you to notify the office and call your Safety Manager). He will review the G.C.'s site specific written program (if one exists) as well as the method by which safety is managed on site. If certain criteria are met, he may conduct a "focused inspection". This is a short form inspection and it is often dealt with quickly.

### Typically, a General, Comprehensive Inspection follows this pattern:

1. The C.O. will
  - a. Request for review, a copy of your safety manual and MSDS.
  - b. Ask you where your written Hazard Communication Program is.
  - c. Ask for your name, employer, local no.
  - d. Request a copy of the Company's OSHA 300 log
2. The inspection begins:
  - a. Anyone who has an interest in the inspection (that is you) may accompany the C.O. during his walk thru (bring paper, pencil, camera)
  - b. Make notes as to what the C.O. alleges is a violation on your part
  - c. Take the same pictures the C.O. takes
  - d. Your troops will be interviewed away from your presence
  - e. A closing conference will be held at the job site at which you must be present. This is when the C.O. will spell out what violations may be cited. Make notes.
3. Post inspection



- a. Citations are mailed to the employer and are to be posted at the job site.
- b. The employer makes an appointment for an Informal Conference, at which he presents a defense.
- c. The violations listed on the citation must be abated (removed, corrected and/or protected) within the time constraints listed on the citation.
- d. A letter stating the methods by which violations were abated must be sent to the issuing OSHA office.
- e. A conclusion is reached and fines are paid or violations are contested.

## **TYPICAL SERIOUS HAZARD DEFINITIONS**

1. Fire hazards and lack of fire extinguishers.
2. Lack of fall protection.
3. Objects falling from above which could strike and injure an employee working below
4. Open-sided floors and unprotected floor openings where a fall would result in serious injury or death
5. Trenching and excavations which are not protected from cave-in or slide
6. Unprotected energized electrical systems/parts which would result in electrocution
7. Lack of grounding of temporary wiring, flexible cords, electrical tools, etc. or ground fault circuit interrupters which could cause electrical shock or electrocution.
8. Environmental hazards such as toxic fumes, toxic mists, or dusts, etc.

## **Project Safety Orientation**

### **All new employees shall receive safety orientation.**

Each employee will receive a New Employee Orientation provided by the Construction Management Team. The orientation session will include a summary of the key aspects of the "The Joint Venture" Policy and identification of hazards of the site.

### **Orientation attendance shall be documented.**

## **PROGRAM ENFORCEMENT**

Each Subcontractor:

- Shall assume responsibility for safety program enforcement by his/her foremen
- Shall see that all accidents or losses are properly investigated and the information passed on to the Construction Management in a timely manner
- Shall see that all new employees receive proper safety indoctrination
- Shall provide proper personal protection equipment (PPE) including hard hat and safety glasses for each worker
- Shall enforce proper use of PPE
- Shall hold weekly Safety Meetings and return signed attendance sheets to the construction manager
- Shall assist with accident investigation to insure proper reporting and documentation, using the information to prevent future loss incidents from occurring.
- During job progress audits, the foreman should be alert for hazardous conditions which could cause a lost time injury or property damage and unnecessary costs to the company
- Shall have the conditions corrected immediately or remove employees from exposure
- Contact the construction manager and communicate the hazard, identify the hazard and its specific locations so that formal contact can be made.

## EMPLOYEE ORIENTATION

Each individual being hired to work at this jobsite will be required to attend an Employee Orientation session prior to beginning employment. The goal of the employee orientation session is to familiarize each employee with the policies and procedures of the work site. The sessions will be conducted prior to the start of work for all new employees.

The following is an outline of the items to be reviewed at each session.

| Task                               | Responsibility |
|------------------------------------|----------------|
| Safety and Loss Control Policy     |                |
| _____                              |                |
| Review of Safety Manual/Procedures |                |
| _____                              |                |
| Review the Emergency Action Plan   |                |
| _____                              |                |

At the conclusion of the orientation, the employees will be given the training confirmation Sheet to fill out. The company representative should review the completed Safety and Health Information for any potential work limitations and advise the Project Manager/Foreman accordingly. The employee then proceeds to the jobsite, and reports to the project foreman for employment.

## **SAFETY HANDBOOK ORIENTATION**

### **YOUR SAFETY REQUIREMENTS**

THIS SHEET MUST BE REVIEWED WITH EACH NEW EMPLOYEE WHEN HE IS ISSUED THE HANDBOOK AND SIGNS THE TEAR OUT FORM IN THE FRONT OF THE HANDBOOK.

#### **Personal Equipment**

- A hard hat must be worn at all times
- Wear a safety harness in elevated areas (6' or more) not protected by guard rails
- Respirators and rubber gloves are to be used on special jobs
- Safety glasses are required when the potential for flying object hazard exists

#### **Tools and Equipment**

- Do not alter tools or guards and use only for their designated purpose.

#### **Barricades**

- Required for excavations and around overhead work. Hole covers or barricades must be placed at all floor openings.
- Do Not cross barricades or taped off areas.

#### **Ladders**

- Straight and extension ladders must be tied off.
- Stepladders must be fully opened and set level.
- Stay off the top step of stepladders.

#### **Welding, Cutting and Burning**

- Remove combustible materials from the immediate area.
- Check equipment for safe working condition.
- Always have a fire extinguisher for the job.

#### **Rigging**

- Never raise or load over people.
- Use tag lines to control a load.
- Know capacities of chain falls, come-alongs, chokers, shackles and clamps and know the weight of the loads.

#### **Orderliness**

- Keep everything in its proper place.
- Put scrap, trash and other waste in the right containers.
- Clean up tools and work areas as your job progresses.

- Keep cords and hoses raised seven (7) feet overhead or Protect them in walkways.
- Keep all material, tools and equipment in a stable position to prevent rolling or falling.
- Maintain clear access to all work areas.

#### **Other**

- Never enter a tank or confined space without a valid "Tank Entry" permit.
- Read all labels on containers of petroleum fuels, solvents, thinners, degreasers, protective coatings, acids and caustics. Ask for a copy of the Material Safety Data Sheet (MSDS) for more detailed information.
- Inspect all electrical tools and cords before each use.

## **COMPLIANCE AND ENFORCEMENT**

The compliance of all employees with our Safety Manual is mandatory and shall be considered a condition of employment.

The following programs will be utilized to ensure employee compliance with the safety program and all safety rules.

- Training programs
- Retraining
- Disciplinary action
- Optional safety incentive programs

### **Training Programs**

The importance of safe work practices and the consequences of failing to abide by safety rules will be covered in the New Employee Safety Orientation and safety meetings. This will help ensure that all employees understand and abide by company safety policies.

### **Retraining**

Employees that are observed performing unsafe acts or not following proper procedures or rules will be retrained by their supervisor. A Safety Contact Report may be completed by the supervisor to document the training. If multiple employees are involved, additional safety meetings will be held.

### **Disciplinary Action**

The failure of an employee to adhere to safety policies and procedures can have a serious impact on everyone concerned. An unsafe act can threaten not only the health and well-being of the employee committing the unsafe act but can also affect the safety of his/her coworkers

and customers. Accordingly, any employee who violates any of the company's safety policies will be subject to disciplinary action.

Note: Failure to promptly report any on-the-job accident or injury, on the same day as occurrence, is considered a serious violation of the Company's Code of Safe Practices. Any employee who fails to immediately report a work-related accident or injury, no matter how minor shall be subject to disciplinary action.

Employees will be disciplined for infractions of safety rules and unsafe work practices that are observed, not just those that result in an injury. Often, when an injury occurs, the accident investigation will reveal that the injury was caused because the employee violated an established safety rule and/or safe work practice(s). In any disciplinary action, the supervisor should be cautious that discipline is given to the employee for safety violations, and not because the employee was injured on the job or filed a Workers' Compensation claim.

Violations of safety rules and the Code of Safe Practices are to be considered equal to violations of other company policy. Discipline for safety violations will be administered in a manner that is consistent with the company's system of progressive discipline. If, after training, violations occur, disciplinary action will be taken as follows:

1. Verbal warning / \*Possible monetary fine
2. Written Warning. Retrain as to correct procedure or work practice / \*Possible monetary fine
3. Written Warning with 3 day suspension / \* Possible monetary fine
4. Termination from the project / \*Possible monetary fine

As in all disciplinary actions, each situation is to be carefully evaluated and investigated. The particular step taken in the disciplinary process will depend on the severity of the violation, employee history, and regard to safety. Managers and supervisors should consult with the office if there is any question about whether or not disciplinary action is justified. Employees may be terminated immediately for willful or extremely serious violations. Union or contract employees are entitled to the grievance process specified by their contract.

**\*Note: Monetary Fine Classification System is located on page 148**

## SAFETY ORIENTATION VERIFICATION FORM

The Supervisor will verbally cover the following items with each new employee on the first day of their employment.

Employee Name: \_\_\_\_\_

Start Date: \_\_\_\_\_

Job Title / Position: \_\_\_\_\_

Instruction has been received in the following areas.

- ☐ 1. Code of Safe Practices. \*
- ☐ 2. Hazard Communication (chemicals hazards) \*
- ☐ 3. Driving Safety Rules. \*
- ☐ 4. Safety rule enforcement procedures.
- ☐ 5. Necessity of reporting ALL injuries, no matter how minor.
- ☐ 6. Proper method of reporting safety hazards.
- ☐ 7. Emergency procedures and First Aid.
- ☐ 8. Proper work clothing & required personal protective equipment.
- ☐ 9. List all special equipment, such as lifts, employee is trained and authorized to use.
- ☐ 10. Emergency Exits and Fire Extinguishers.

\_\_\_\_\_  
\_\_\_\_\_

\* Give a copy of these items to the employee.

I agree to abide by all company safety policies and the Code of Safe Practices. I also understand that failure to do so may result in disciplinary action and possible termination.

### Employee Warning Notice

Employee \_\_\_\_\_

Supervisor \_\_\_\_\_

Date \_\_\_\_\_

#### Employer Statement

Date of incident: \_\_\_\_\_ Time \_\_\_\_\_

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Signature \_\_\_\_\_

#### Employee Statement

Date of incident: \_\_\_\_\_ Time \_\_\_\_\_

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Signature \_\_\_\_\_

Action to be taken: \_\_\_\_\_

I have read this warning and I understand it.

Supervisor signature

Employee signature

\_\_\_\_\_

\_\_\_\_\_

Date

Date



## Personal Protective Equipment (PPE)

Includes, but is not limited to the following;

### Eye Protection

Contractors shall be responsible for employees wearing the appropriate personal protective equipment on the construction site, if there is an exposure to a hazardous condition, or if regulations require the use of specified equipment to reduce the hazards on site.

- Safety glasses shall be used for impact and flying objects protection.
- Prescription safety glasses (that meet ANSI Rating) shall have side shields in place, if being used as safety glasses
- Goggles shall be worn whenever chemicals are used, or there is a splash potential
- Face Shields are secondary protection. They must be worn over safety glasses or goggles.

Eye Protections for this project shall be worn;

- When performing work that involves impact
- When using chemicals
- As required by the tool or products manufacturer.

**The use of safety glasses at all times is strongly recommended.**

### Fall Protection

- Shall be supplied and maintained by the appropriate contractor(s)
- All contractors are responsible for the use of fall protection on site.
- All fall protection equipment shall be properly inspected before use, and shall be maintained in accordance with the requirements of the manufacturer
- Fall protection shall be kept clean and stored in appropriate containers (when not in use) to protect it from environmental conditions and other damage
- **Fall protection is required at 6 feet for employees of from trades.**

### Foot Protection

- Appropriate footwear is required. No sneakers, sandals, etc.
- Foot protection shall be work-type specific (i.e. EH – Electrical Hazards, Metatarsal, Etc.)

### Hand Protection

- For this project, the following types of hand protection shall be used;
- \_\_\_\_\_

## **Hearing Protection**

All employees shall be provided with hearing protection to reduce the dB levels in accordance with OSHA requirements.

- The contractors shall make the following hearing protection available :
  - Ear Plugs
  - Ear Muffs
  - Other Engineering Control:
  - \_\_\_\_\_

## **Head Protection**

- Hard Hats shall be worn by all persons at all times.

## **High Visibility Clothing**

- High visibility Class 2 or greater outerwear is required on this project at all times.

## **Safety Requirements**

### **GENERAL RULES**

#### **All Employees**

#### **Ladders and Step Ladders**

1. Read and follow the manufacturer's instruction label affixed to the ladder.
2. Do not use ladders that have loose rungs, cracked, or split side rails, missing rubber footpads, or are otherwise visibly damaged.
3. Keep ladder rungs clean and free of grease. Remove buildup of material such as dirt or mud.
4. Do not place ladders in a passageway or doorway without posting warning signs or cones that detour pedestrian traffic away from the ladder. Lock the doorway that you are blocking with the ladder and post signs that will detour traffic away from your work.
5. Do not place a ladder at a blind corner or doorway without diverting foot traffic by blocking or roping off the area.
6. Allow only one person on the ladder at a time.
7. Face the ladder when climbing up or down it.
8. Maintain a three-point contact by keeping both hands and one foot or both feet and one hand on the ladder at all times when climbing up or down the ladder.
9. When performing work from a ladder, face the ladder and do not lean backward or sideways from the ladder.
10. Do not stand on tables, chairs, boxes or other improvised climbing devices to reach high places. Use the ladder or stepstool.
11. Do not stand on the top two rungs of any ladder.
12. Do not stand on a ladder that wobbles, or that leans to the left or right of center.
13. When using a straight or extension ladder, extend the top of the ladder at least 3 feet above the edge of the landing.
14. Secure the ladder in place by having another employee hold it if it cannot be tied to the structure.
15. Do not move a rolling ladder while someone is on it.
16. Do not place ladders on barrels, boxes, loose bricks, pails, concrete blocks, or other unstable bases.
17. Do not carry items in your hands while climbing up or down a ladder.
18. Do not try to "walk" a ladder by rocking it. Climb down the ladder, and then move it.
19. Do not use a ladder as a horizontal platform.

## **Lifting Procedures**

1. Plan the move before lifting; ensure that you have an unobstructed pathway.
2. Test the weight of the load before lifting by pushing the load along its resting surface.
3. If the load is too heavy or bulky, use lifting and carrying aids such as hand trucks, dollies, pallet jacks and carts, or get assistance from a co-worker.
4. If assistance is required to perform a lift, coordinate and communicate your movements with those of your co-worker.
5. Position your feet 6 to 12 inches apart with one foot slightly in front of the other.
6. Face the load.
7. Bend at the knees, not at the back.
8. Keep your back straight.
9. Get a firm grip on the object using your hands and fingers. Use handles when they are present.
10. Hold the object as close to your body as possible.
11. While keeping the weight of the load in your legs, stand to an erect position.
12. Perform lifting movements smoothly and gradually; do not jerk the load.
13. If you must change direction while lifting or carrying the load, pivot your feet and turn your entire body. Do not twist at the waist.
14. Set down objects in the same manner as you picked them up, except in reverse.
15. Do not lift an object from the floor to a level above your waist in one motion. Set the load down on a table or bench and then adjust your grip before lifting it higher.
16. Never lift anything if your hands are greasy or wet.
17. Wear protective gloves when lifting objects that have sharp corners or jagged edges.

## **Electric Powered Tools**

1. Do not use power equipment or tools on which you have not been trained.
2. Keep power cords away from the path of drills, saws, vacuum cleaners, floor polishers, mowers, slicers, knives, grinders, irons, and presses.
3. Do not carry plugged-in equipment or tools with your finger on the switch.
4. Do not carry equipment or tools by the cord.
5. Disconnect the tool from the outlet by pulling on the plug, not the cord.
6. Turn the tool off before plugging or unplugging it.
7. Do not leave tools that are "On" unattended.
8. Do not handle or operate electrical tools when your hands are wet or when you are standing on wet floors.

9. Do not operate spark inducing tools such as grinders, drills, or saws near containers labeled "Flammable" or in an explosive atmosphere such as a paint spray booth.
10. Turn off electrical tools and disconnect the power source from the outlet before attempting repairs or service work. Tag the tool "Out of Service."
11. Do not connect multiple electrical tools into a single outlet.
12. Do not run extension cords through doorways, through holes in ceilings, walls, or floors.
13. Do not drive over, drag, step on or place objects on a cord.
14. Do not operate a power hand tool or portable appliance with a two-pronged adapter or a two-conductor extension cord.
15. Do not use a power hand tool while wearing wet cotton gloves or wet leather gloves.
16. Never operate electrical equipment barefooted. Wear rubber-soled or insulated work boots.
17. Do not operate a power hand tool or portable appliance while holding a part of the metal casing or holding the extension cord in your hand. Hold all portable power tools by the plastic handgrips or other nonconductive areas designed for gripping purposes.
18. Do not operate a power hand tool or portable appliance that has a frayed, worn, cut, improperly spliced, or damaged power cord.
19. Do not operate a power hand tool or portable appliance if the ground pin from the three-pronged power plug is missing or has been removed.

## **Hand Tools**

1. Use tied-off containers to keep tools from falling off scaffolds and other elevated work platforms.
2. Keep the blades of all cutting tools sharp.
3. Carry all sharp tools in sheaths or holsters.
4. Tag worn, damaged, or defective tools "Out of Service" and do not use them.
5. Do not use a tool if its handle has splinters, burrs, cracks, splits or if the head of the tool is loose.
6. Do not use impact tools such as hammers, chisels, punches, or steel stakes that have mushroomed heads.
7. When handing a tool to another person, direct sharp points and cutting edges away from yourself and the other person.
8. Do not chop at heights above your head when working with a hand axe.
9. Do not carry sharp or pointed hand tools such as screwdrivers, scribes, aviation snips, scrapers, chisels or files in your pocket unless the tool or pocket is sheathed.
10. Do not perform "make-shift" repairs to tools.
11. Do not use "cheaters" on load binders or "boomers."
12. Do not carry tools in your hand when climbing. Carry tools in tool belts or hoist the tools to the work area with a hand line.

13. Do not throw tools from one location to another, from one employee to another, from scaffolds or other elevated platforms.

### **Chisels**

1. Keep the cutting edge of the chisel sharp.
2. Do not use chisels with damaged striking ferrules.
3. Hold a chisel with a tool holder if possible.
4. Clamp a small work piece in a vise and chip towards the stationary jaw when working with a chisel.

### **Clamps**

1. Do not use the C-clamp for hoisting materials.
2. Do not use the C-clamp as a permanent fastening device.

### **Files/Rasps**

1. Do not use a file as a pry bar, hammer, screwdriver, or chisel.
2. When using a file or a rasp, grasp the handle in one hand and the toe of the file in the other.
3. Do not hammer on a file.

### **Hammers**

1. Use a claw hammer for pulling nails and driving nails.
2. Do not strike nails or other objects with the cheek of the hammer.
3. Do not strike a hardened steel surface, such as a cold chisel, with a claw hammer.
4. Do not strike one hammer against another hammer.
5. Do not use a hammer if your hands are oily, greasy, or wet.
6. Do not use a hammer as a wedge, a pry bar or for pulling large spikes.
7. Use only a sledge-type hammer on a striking face wrench.

### **Knives/Sharp instruments**

1. When handling knife blades and other cutting tools, direct sharp points and edges away from you.
2. Store knives in knife blocks or in sheaths after use.
3. Do not use knives with dull blades.
4. Do not use honing steels that do not have disc guards.
5. Do not attempt to catch a falling knife.

6. Use knives for the operation for which they are named.
7. Do not use knives with broken or loose handles.
8. Do not use knives as screwdrivers, pry bars, can openers or ice picks.
9. Do not pick up knives by their blades.
10. Carry knives with their tips pointed towards the floor.

## **Pliers**

1. Do not attempt to force pliers by using a hammer on them.
2. Do not slip a pipe over the handles of pliers to increase leverage.
3. Use pliers with insulated handles for electrical work.
4. Do not use pliers that are cracked, broken, or sprung.
5. When using diagonal cutting pliers, shield the loose pieces of cut material from flying into the air by using a cloth or your gloved hand.

## **Saws**

1. Do not use an adjustable blade saw such as a hacksaw, coping saw, keyhole saw, or bow saw, if the blade is not taut.
2. Do not use a saw that has dull saw blades.
3. Keep hands and fingers away from the saw blade while using the saw.
4. Do not carry a saw by the blade.
5. When using a handsaw, hold the work piece firmly against the worktable.
6. Do not use woodworking equipment such as circular saws, radial saws, or jointers if they do not have guards on the saw blade.
7. Keep control of saws by decreasing downward pressure at the end of the stroke.
8. When operating scroll saws, stop the machine before removing scrap pieces from the table.
9. Clamp work when using a hole saw.

## **Screwdrivers**

1. Always match the size and type of screwdriver blade to fit the head of the screw.
2. Do not hold the work piece against your body while using a screwdriver.
3. Do not put your fingers near the blade of the screwdriver when tightening a screw.
4. Use an awl, drill or a nail to make a starting hole for screws.
5. Do not force a screwdriver by using a hammer or pliers on it.
6. Do not use a screwdriver as a punch, chisel, pry bar or nail puller.
7. Use a screwdriver that has an insulated handle for electrical work.

8. Do not use a screwdriver if your hands are wet, oily, or greasy.
9. Do not use a screwdriver to test the charge of a battery.
10. When using a spiral ratchet screwdriver, push down firmly and slowly.

### **Snips**

1. Wear safety glasses or safety goggles when using snips to cut materials.
2. Wear work gloves when cutting materials with snips.
3. Do not use straight cut snips to cut curves.
4. Keep the blade aligned by tightening the nut and bolt on the snips.
5. Do not use snips as a hammer, screwdriver, or pry bar.
6. Use the locking clip on the snips after use.

### **Vises**

1. When clamping a long work piece in a vise, support the far end of the work piece by using an adjustable pipe stand, sawhorse, or box.
2. Position the work piece in the vise so that the entire face of the jaw supports the work piece.
3. Do not use a vise that has worn or broken jaw inserts, or has cracks or fractures in the body of the vise.
4. Do not slip a pipe over the handle of a vise to gain extra leverage.

### **Personal Protective Equipment**

1. Do not paint or drill holes in hard hats.
2. Do not wear hard hats that are dented or cracked.
3. Wear safety glasses, goggles, or face shield when using chippers, grinders, lathes, or sanders.
4. Wear earplugs or earmuffs in areas posted "Hearing Protection Required."

### **Pneumatic Tools**

1. Do not point a compressed air hose at bystanders or use it to clean your clothing.
2. Do not use tools that have handles with burrs or cracks.
3. Do not use compressors if their belt guards are missing. Replace belt guards before use.
4. Turn the tool "off" and let it come to a complete stop before leaving it unattended.
5. Disconnect the tool from the airline before making any adjustments or repairs to the tool.
6. Engage positive locks on hoses and attachments before use.



7. Shut off pressure valve and disconnect airline when not in use.
8. Tag damaged or defective pneumatic tools "Out of Service" to prevent usage of the tool by other employees.

### **Powder Actuated Tools**

1. Only employer-authorized personnel, with a valid certification card may operate powder-actuated tools.
2. Wear safety glasses, goggles, or face shields when operating powder actuated tools.
3. Wear earplugs or earmuffs when making fastenings.
4. Do not permit bystanders in the area when using a powder-actuated tool.
5. Do not load tool until ready to make a fastening.
6. Keep tool pointed in a safe direction (away from personnel).
7. Post a sign alerting co-workers that a powder actuated tool is being used.
8. After use, lock powder actuated tools and powder loads in a container and store in a safe place such as a locker or the trunk of a car.

### **SCA**

1. Follow the manufacturer's instructions when erecting the scaffold.
2. Do not work on scaffolds outside during stormy or windy weather.
3. Do not climb on scaffolds that wobble or lean to one side.
4. Initially inspect scaffold prior to mounting. Do not use a scaffold if any pulley, block, hook, or fitting is visibly worn, cracked, rusted, or otherwise damaged. Do not use a scaffold if any rope is frayed, torn, or visibly damaged.
5. Do not use any scaffold tagged "Out of Service."
6. Do not use unstable objects such as barrels, boxes, loose brick or concrete blocks to support scaffolds or planks.
7. Do not use a scaffold unless guardrails and all flooring are in place.
8. Level the scaffold after each move. Do not extend adjusting leg screws more than 12 inches.
9. Do not walk or work beneath a scaffold unless a wire mesh has been installed between the mid-rail and the toe board or planking.
10. Use safety belts and lanyards when working from scaffolds that are higher than 10 feet and that do not have top and mid-guard rails.
11. Do not climb the cross braces for access to the scaffold. Use a ladder.
12. Do not jump from, to, or between scaffolding.
13. Do not slide down cables, ropes or guys used for bracing.

14. Keep both feet on the decking. Do not sit or climb on the guardrails.
15. Do not lean out from the scaffold. Do not rock the scaffold.
16. Keep the scaffold free of scraps, loose tools, tangled lines and other obstructions.
17. Do not throw anything "overboard" unless a spotter is available. Use debris chutes or lower things by hoist or by hand.
18. Do not move a mobile scaffold with anyone on the scaffold.
19. Lock and chock wheels on rolling scaffolds before using.

## **Stairways, Floors and Openings**

1. Do not work on open sided floors, elevated walkways or elevated platforms if there are no guardrails in place.
2. Stand clear of floor openings if guardrails or covers are removed or displaced.

## **Heavy Equipment Operators**

### **Site Safety**

1. Do not start work until barricades, barrier logs, fill or other protection have been installed to isolate the work area from local traffic.
2. Do not work outdoors during lightning storms.
3. Drink plenty of clear liquids during your breaks.
4. Take breaks in shaded areas.

### **Forklifts Pre-Use Inspection**

Do not use forklift if any of the following conditions exist:

1. The mast has broken or cracked weld-points.
2. The roller tracks are not greased or the chains are not free to travel.
3. Forks are unequally spaced or cracks exist along the blade or at the heels.
4. Hydraulic fluid levels are low.
5. Hydraulic line and fitting have excessive wear or are crimped.
6. Fluid is leaking from the lift or the tilt cylinders.
7. The hardware on the cylinders is loose.
8. Tires are excessively worn, split, or have missing tire material.
9. Air filled tires are not filled to the operating pressure indicated on the tire.
10. Batteries have cracks or holes, uncapped cells, frayed cables, broken cable insulation, loose connections, or clogged vent caps.

### **Starting the Forklift**

1. Apply the foot brake and shift gears to neutral before turning the key.

### **Picking Up a Load**

1. Square up on the center of the load and approach it straight on with the forks in the travel position.
2. Stop when the tips of your forks are about a foot from the load.
3. Level the forks and slowly drive forward until the load is resting against the backrest of the mast.
4. Lift the load high enough to clear whatever is under it.
5. Back up about one foot, and then slowly and evenly tilt the mast backwards to stabilize the load.

### **Putting a Load Down**

1. Square up and stop about one foot from desired location.
2. Level the forks and drive to the loading spot.
3. Slowly lower the load to the floor.
4. Tilt the forks slightly forward so that you do not hook the load.
5. When the path behind you is clear of obstructions, back straight out until the forks have cleared the pallet.

### **Stacking One Load on Top of Another**

1. Stop about one foot away from the loading area and lift the mast high enough to clear the top of the stack.
2. Slowly move forward until the load is squarely over the top of the stack.
3. Level the forks and lower the mast until the load is no longer supported by the forks.
4. Look over both shoulders for obstructions and back straight out if the path is clear.

### **Forklift Safety Rules**

1. Do not exceed the lift capacity of the forklift. Read the lift capacity plate on the forklift if you are unsure.
2. Follow the manufacturer's guidelines concerning changes in the lift capacity before adding attachments, such as wedges, to a forklift.
3. Lift the load an inch or two to test for stability: If the rear wheels are not in firm contact with the floor, take a lighter load or use a forklift with a higher lift capacity.
4. Do not raise or lower a load while you are en-route. Wait until you are in the loading area and have stopped before raising or lowering the load.
5. After picking up a load, adjust the forks so that the load is tilted slightly backward for added stability.

6. Drive with the load at a ground clearance height of 4-6 inches at the tips and 2 inches at the heels in order to clear most uneven surfaces and debris.
7. Drive at a walking pace and apply brakes slowly to stop when driving on slippery surfaces such as icy or wet floors.
8. Approach angle railroad tracks at a 45
9. Do not drive over objects in your pathway.
10. Do not drive into an area with a ceiling height that is lower than the height of the mast or overhead guard.
11. Steer wide when making turns.
12. Do not drive up to anyone standing or working in front of a fixed object such as a wall.
13. Do not drive along the edge of an unguarded elevated surface such as a loading dock or staging platform.
14. Obey all traffic rules and signs.
15. Sound horn when approaching blind corners, doorways, or aisles to alert other operators and pedestrians.
16. Do not exceed a safe working speed of five miles per hour. Slowdown in congested areas.
17. Stay a minimum distance of three truck lengths from other operating mobile equipment.
18. Drive in reverse and use a signal person when your vision is blocked by the load.
19. Look in the direction that you are driving; proceed when you have a clear path.
20. Do not use bare forks as a man-lift platform.
21. Do not drive the forklift while people are on the attached man-lift platform.
22. Drive loaded forklifts forward up ramps.
23. Raise the forks an additional two inches to avoid hitting or scraping the ramp surface as you approach the ramp.
24. Drive loaded forklifts in reverse when driving down a ramp.
25. Drive unloaded forklifts in reverse going up a ramp and forward going down a ramp.
26. Do not attempt to turn around on a ramp.
27. Do not use "Reverse" to brake.
28. Lower the mast completely, turn off the engine, and set the parking brake before leaving your forklift.

### **Power Hoist Safety**

1. Use manufacturer approved counter weights to secure the hoist. Do not use roofing materials such as rolls of felt or bundles of shingles,
2. Do not exceed the manufacturer's recommended load capacity limits.
3. Only trained personnel, approved by the employer, are allowed to operate a power hoist.

4. Use the power hoist in an area that permits the operator to stand clear of the load at all times.
5. Use safety hooks or shackles to attach the load whenever possible.
6. Use 'tag lines' to control the load when necessary.
7. Keep your fingers and clothing clear of hoist machinery.
8. Do not attempt adjustments while the hoist is running.

### **Portable Welding Equipment**

1. Wear a welding helmet or welding goggles during welding operations.
2. Do not use personal or employee-owned power tools and portable appliance while at work.
3. Do not perform welding tasks while wearing wet cotton gloves or wet leather gloves.
4. Insulated work gloves are required for all welders when using welding equipment.
5. Do not use welding apparatus if power plug is cut, frayed, split or otherwise visibly damaged or modified.
6. When replacing power plugs and cords of welding apparatus, always check to ensure that the ground wire is connected and the power plug prongs are not worn off, allowing the plug to be inserted backward.

### **Compressed Gas Cylinders**

#### **Storage and Handling**

1. Do not handle oxygen cylinders if your gloves are greasy or oily.
2. Store all cylinders in the upright position.
3. Place valve protection caps on gas cylinders that are in storage or not in use.
4. Do not lift cylinders by the valve protection cap.
5. Do not store compressed gas cylinders in areas where they can come in contact with chemicals labeled "Corrosive."
6. Place cylinders on a cradle, sling board, pallet or cylinder basket to hoist them.
7. Do not place cylinders against electrical panels or live electrical cords where the cylinder can become part of the circuit.
8. Do not use a flame to check for propane cylinder leak, use a leak or monitor detector.
9. Use of Cylinders
10. Do not use dented, cracked, or other visually damaged cylinders.
11. Use only an open ended or adjustable wrench when connecting or disconnecting regulators and fittings.
12. Do not transport cylinders without first removing regulators and replacing the valve protection caps.

13. Close the cylinder valve when work is finished, when the cylinder is empty or at any time, the cylinder is moved.
14. Do not store oxygen cylinders near fuel gas cylinders such as propane or acetylene or near combustible material such as oil or grease.
15. Stand to the side of the regulator when opening the valve.
16. If a cylinder is leaking around a valve or a fuse plug, move it to an outside area away from where work is performed and tag it to indicate the defect.
17. Do not hoist or transport cylinders by means of magnets or choker slings.
18. Do not use compressed gas to clean the work area, equipment, or yourself.
19. Do not remove the valve wrench from acetylene cylinders while the cylinder is in use.
20. Open compressed gas cylinder valves slowly. Open fully when in use to eliminate possible leakage around the cylinder valve stem.
21. Purge oxygen valves, regulators, and lines before use.

### **Torch on Applications**

1. "Blow Out" hoses before attaching the torch.
2. Inspect hoses and torches before use. Replace damaged, burned, worn, or leaking parts.
3. Use a pressure gauge on every regulator. Do not use an adjustable regulator with a higher-pressure range than the original regulator that came with the torch.
4. Never face the gauge while opening the cylinder valve.
5. Before lighting a torch, purge the hose, adjust the working pressures, then use a friction lighter to ignite the gases. Do not use matches or a cigarette lighter.
6. Do not use oil, grease or other lubricants on the regulator.
7. When shutting off the torch, close the gas cylinder valve first and let the remaining gas burn out of the hose before closing off the torch valve.
8. Never overfill a gas cylinder. It could explode.
9. Use only hoses listed for liquid petroleum (LP) gas.
10. Use soap solution to test for gas leaks before lighting.
11. Visually check and ensure that the flow of gas through the regulator is flowing in the proper direction. Directional flow is stamped on the regulator.
12. To keep 'frosting' from occurring, increase the size of the bottle or cylinder.
13. Secure propane tanks in an upright position and place them at least 10 feet from the open flame.
14. Keep non-applicators at least 10 feet from the flame.
15. Keep vent in pressure regulator clear at all times.
16. When shutting off the torch, close the propane cylinder valve first and let the remaining gas burn out of the hose.

17. Do not leave a lighted torch unattended.
18. Do not heat a cylinder to increase pressure.
19. Place a fire extinguisher near you, but away from the torch and other parts of LP gas equipment, when performing torch on operations.
20. Do not lay an operating torch over the edge of a roof.
21. Do not use a trowel as a torch stand.
22. Do not lay an operating torch to rest on a gas cylinder. If there is a gas leak in the cylinder area, there could be a fire.

### **Vehicle Loading**

1. Plan the move before loading; ensure that you have an unobstructed pathway and that the vehicle is parked as close to the equipment or material as possible.
2. Keep bumpers/tailgates free of grease, water, etc.; remove buildup of material such as dirt, mud, etc.
3. Use lifting aids such as dollies, pallet jack, and forklift or get assistance from a co-worker to place dock plate resting between loading dock and truck surface.
4. If equipment or material that is to be loaded into truck is too heavy or bulky, use lifting aids such as hand trucks, dollies, pallet jacks and carts, or get assistance from co-workers.
5. Secure all equipment and material within the truck to eliminate or reduce movement.

## Emergency Action Plan

### Fire Alarms

All employees and visitors are required to evacuate the building or site in the event of a fire alarm, regardless of cause or time.

1. For reasons of muster, "The Joint Venture" shall, before any work is initiated, identify specific **muster area** for each contractor, trade or manageable group.
2. Muster areas shall be  $\geq 50'$  from the building.
3. **The Muster Area for this project will be outside the Construction Manager Trailers unless otherwise directed by the Construction Manager**
  - It is the responsibility of the individual group, (by contractor, trade etc.), to determine whether or not all of their personnel evacuated the building, and if not, to report the names of the missing (or unaccounted person(s)) to the fire department incident commander, the local police/security department, and the project superintendent.

### Fire

In the event of an actual fire or smoke condition, the previously identified (through training) procedures shall be followed: Notify all persons in the immediate area of the fire to initiate evacuation.

- **Close** the door to the fire area/room to contain the fire and/or smoke condition after everyone has left area.
- **Activate Alarm** (fire alarm, horn or other suitable warning device) to initiate building evacuation.
- **Evacuate the building**
- **Phone Police** (911)

### Medical Emergency

Emergencies (which include significant lacerations, amputations, head, neck or back injuries, loss of consciousness, allergic reactions, diabetic emergencies, seizures, difficulty breathing, stroke and unknown illness or injuries) shall require the response of an ambulance. 911 or the local emergency number;

Unless required for reasons of personal safety (such as explosion, fire, structural failure etc.), no person needing emergency first aid shall be relocated, as this may compromise their health, safety and well-being.

- A designated person shall be identified to meet the ambulance at a pre-determined location, and direct the ambulance crew into the area or building where the incident has occurred.



## **First-Aid**

Every work site shall have access to at least one first-aid kit in a weatherproof container. The first-aid kit will be inspected regularly to ensure that it is well stocked, in sanitary condition, and any used items are promptly replaced. The contents of the first-aid kit shall be arranged to be quickly found and remain sanitary. First-aid dressings shall be sterile and in individually sealed packages.

Drugs, antiseptics, eye irrigation solutions, inhalants, medicines, or proprietary preparations shall not be included in first-aid kits unless specifically approved, in writing, by an employer-authorized, licensed physician. Other supplies and equipment, if provided, shall be in accordance with the documented recommendations of an employer-authorized licensed physician upon consideration of the extent and type of emergency care to be given based upon the anticipated incidence and nature of injuries and illnesses and availability of transportation to medical care.

Each project will have a Blood-Borne Pathogens Kit for the safe cleaning of surfaces contaminated by blood or other bodily fluids.

Proper equipment for the prompt transportation of the injured or ill person to a physician or hospital where emergency care is provided, or an effective communication system for contacting hospitals or other emergency medical facilities, physicians, ambulance and fire services, shall also be provided. The telephone numbers of the following emergency services in the area shall be posted near the job telephone, or otherwise made available to the employees where no job site telephone exists:

1. A company authorized physician or medical clinic, and at least one alternate if available.
2. Hospitals.
3. Ambulance services
4. Fire-protection services.

Prior to the commencement of work at any site, the Supervisor or Manager shall locate the nearest preferred medical facility and establish that transportation or communication methods are available in the event of an employee injury.

Each employee shall be informed of the procedures to follow in case of injury or illness through our new employee orientation program, Code of Safe Practices, and safety meetings. Where the eyes or body of any person may be exposed to injurious or corrosive materials, suitable facilities for drenching the body or flushing the eyes with clean water shall be conspicuously and readily accessible.

## **Area Hospitals:**

### **U-Mass Memorial**

26 Queen Street

Worcester, Ma 01603

855-862-7763

### **Saint Vincent**

123 Summer Street

Worcester, Ma 01603

### **Urgent Care Facility**

#### **AFC Urgent Care**

117A Stafford Street,

Worcester, Ma

508-755-4010

## **Injury Reporting**

- All injuries and illness shall be reported to one of the following person(s) as soon as possible.
- Mark Hogan, "The Joint Venture" Superintendent 413- 246-4793
- Bill Faneuf, "The Joint Venture" Superintendent 413-531-3566
- Jamie Blume, "The Joint Venture" Project Manager 617-823-7639

## **Emergency Contacts for this project**

|                              |               |                           |
|------------------------------|---------------|---------------------------|
| Superintendent- Mark Hogan   | 413- 246-4793 | mhogan@fontainebros.com   |
| Superintendent- Bill Faneuf  | 413-531-3566  | bfaneuf@ fontainebros.com |
| Project Manager- Jamie Blume | 617-823-7639  | jblume@ fontainebros.com  |
| Safety Director- Roger Mee   | 413-244-3119  | rmee@fontainebros.com     |

## Voluntary Respirator Use

Voluntary respirator use by workers is permitted as long as the equipment is proper for the intended use, NIOSH Approved, and has been inspected and the worker signs a Voluntary Respirator Use Waiver.

Appendix D to Sec. 1910.134 (Mandatory) Information for Employees Using Respirators When Not Required Under the Standard

### VOLUNTARY RESPIRATOR USE FORM

I, \_\_\_\_\_, am requesting to use the

following dust/mist respirator (\_\_\_\_\_)

for the following tasks (\_\_\_\_\_).

I understand the hazard to myself is minimal, and I should be able to complete the task without a respirator, if necessary. I am not aware of any current health conditions or family history involving heart/lung disease or breathing disorders that may be affected by the wearing of a disposal respirator. Should I develop any health conditions, I will immediately stop work, notify my immediate supervisor and consult with a medical professional for further evaluation.

I have read 29CFR1910.134 (1998) (Appendix D) (below).

Questions on respirator use can be answered by my supervisor or the Safety Director.

\_\_\_\_\_ (Respirator User) \_\_\_\_\_ (Date)

\_\_\_\_\_ (Immediate Supervisor) \_\_\_\_\_ (Date)

## **Appendix D to Sec. 1910.134 (Mandatory) Information for Employees Using Respirators When Not Required Under the Standard**

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator. [63 FR 1152, Jan. 8, 1998; 63 FR 20098, April 23, 1998]

## Means of Egress

All means of egress within the area or building shall be properly maintained for health and safety reasons.

- Personnel must be able to enter and exit the area, building or facility without hazard.
- All corridors and other walk / work surfaces shall be free of accumulated dust(s) and waste.
- Boxes, cardboard and other combustible material shall be kept to a minimum to reduce the risk of fire.
- Cords and other potential trip hazards shall be run along the base of the wall or overhead.
  - Cords run overhead shall not be run above ceilings, ceiling grids or through walls.
  - Cords run overhead should be hung by non-metallic means such as rope, string or tape.
- Corridors shall not be used for the storage or placement of gases.
  - Combustible storage should be placed in a separate area or room, in case of fire.
  - Equipment should be properly stored to prevent trip and fall, and for ease of retrieval.
- Flammable Gas and Liquid storage shall be kept to a minimum, and shall be stored in a manner acceptable to the owner and the local fire department.
  - Flammable gases and liquids shall not be placed or otherwise stored in a “means of egress”, such as a corridor or exit.
  - Flammable and combustible liquids shall be placed in approved metal (self-closing) cans and Flammable Storage Cabinets.
- All floors, unless otherwise permitted by the Building Official, shall have (2) separate and distinct means of egress.
  - If a stairwell must be removed, or temporarily made inaccessible, it shall be the responsibility of “The Joint Venture” to create another means of emergency egress, which could include, but is not limited to;
- Ladders to lower floor or ground
- Access to scaffold/staging
  - Whenever an Exit is temporarily closed or relocated, “The Joint Venture” shall make the following site modifications;
    - Cover or remove any reference to the existing signage
    - Post exit signage at the new location and
    - Direct employees and visitors to the new or temporary exit, as required

All means of egress must be properly identified, as required by the building official and OSHA. At a minimum the EXIT sign must be;

- Green or Red in color
- At least 2' above the floor
- Easily recognizable
- All **EXIT** signs that no longer serve an actual exit, must...

- be covered to prevent confusion, and
- shall have alternative exit signage (with arrows) in place to re-direct occupants to the new exit.
- Lighting is the responsibility of “The Joint Venture”, or their identified designee. Adequate illumination must be maintained at all times for reasons of safety.
- Emergency lighting is required in areas where work may be necessary at night, or in locations below grade, in cases of power failure
- All temporary lighting must have the appropriate guards, as required
- The wattage of the light bulbs shall not exceed the manufacturers specifications for the light fixture

## ENVIRONMENTAL

### Hazardous Materials

- “The Joint Venture” shall make the owner or the owner’s designee/representative aware of any hazardous materials found on site that were not previously addressed or identified at the beginning of the project.
- “The Joint Venture” shall notify the owner or the owner’s designee/representative about any hazardous material incidents on site, regardless of size or quantity.
  - Leaks, spills or other types of contamination to air, soil or water which include chemicals, gasoline, hydraulic fluids and oils must be reported immediately
    - If the leak or spill is a “reportable quantity” of a chemical, gas or oil greater than 10 gallons (may be less depending on material), spilled directly to water regardless of quantity, or spilled to a direct pathway to water (i.e. storm drain), the owner or the owner's designee / representative must be notified, the local fire department and/or the Massachusetts Department of Environmental Protection shall be notified.
  - Hazardous materials shall be contained and labeled in a manner acceptable to the authority having jurisdiction.
  - Hazardous materials shall be properly labeled, as referenced in the Hazard Communications section of this program.

Hazardous materials including chemicals, cleaning agents, including those used for power washing of buildings and oil shall not be discharged or disposed of; to driveway, ground, road, sewer, storm drain or trash / waste receptacle or any other non-approved manner.

- The facility (owner) shall identify, with appropriate environmental assistance, the most appropriate manner in which to properly discard the hazardous material or waste, in accordance with the requirements of the state and federal environmental protection requirements.
  - For additional information and regulatory requirements, see the following sections;
    - Hazardous Waste

- Solid Waste and Recycling
- Storm Water
- Universal Waste

## **Hazardous Waste**

Each contractor and sub-contractor is ultimately responsible for the identification, disposal and record keeping requirements of hazardous waste generated from the site and processes, such as lead based paint, asbestos, contaminated materials, and chemicals present at the facility. Contractors and sub-contractors are responsible for any waste they create on the site that is unrelated to the owner, including but not limited to; cutting oil, and concrete cleaners, cleaning compounds, solvents etc..

## **Storm Water**

- As part of this requirement, this project shall have a storm water pollution protection plan (SWPPP) to limit the discharge of construction materials, waste, including chemicals, cleaning materials, mud and sand into a storm drain and other "navigable" waterways.
  - The SWPPP, because it applies to ground water and water run-off must take into consideration all potential wastes leaving the construction site.
    - Acid or power washing of buildings must be controlled in a manner acceptable to the DEP / EPA
    - Areas for the washing of vehicles and concrete equipment must be controlled.
    - Oil must be stored in a manner to prevent the release in the case of a spill. "The Joint Venture" must check with the Owner to determine if SPCC regulations apply. If so, "The Joint Venture" must supply a list of all oil being stored in 55 gallons or larger to the owner, and must abide by the SWPPP.
- The responsible contractor shall control run-off with appropriate measures that may include, but are not limited to;
  - Catch basin filters
  - Soil retaining measures
  - Street sweeping (frequent)
- "The Joint Venture", the sub-contractor (if applicable) and the Owner shall meet and discuss all options available to decide on the best management practices for the control of run-off.

## HEALTH

### General Health and Sanitation

- Housekeeping practices are reflective of the site health and sanitation program
- Contractors and sub-contractors shall be responsible for providing their workers with adequate potable water and disposable cups for the purpose of employee hydration.
- "The Joint Venture" shall provide the appropriate sanitary restroom facilities, unless otherwise negotiated with the owner.
- All restroom facilities shall have, as a minimum alcohol-based hand cleaners and disposable toilet paper.

### HAZARD COMMUNICATION (GHS) SAFETY PLAN

**DEFINITIONS:** For purposes of HAZARD COMMUNICATION (GHS) SAFETY PLAN, the following will apply:

1. **"Article"** means a manufactured item other than a fluid or particle that is formed to a specific shape or design during manufacture, and has use function(s) dependent in whole or in part upon its shape or design during end use; and under normal conditions of use does not release more than very small quantities, e.g., minute or trace amounts of a Hazard chemical and does not pose a physical hazard or health risk to employees.
2. **"Assistant Secretary"** means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.
3. **"Chemical"** means any substance, or mixture of substances.
4. **"Chemical Manufacturer"** means a manufacturer with a workplace where chemical(s) are produced for use or distribution.
5. **"Chemical Name"** means the scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or a name that will clearly identify the chemical for the purpose of conducting a hazard classification.
6. **"Classification"** means to identify the relevant data regarding the hazards of a chemical; review those data to ascertain the hazards associated with the chemical; and decide whether the chemical will be classified as Hazard according to the definition of a Hazard chemical. In addition, classification for health and physical hazards includes the determination of the degree of hazard by comparing the data with the criteria for health and physical hazards.
7. **"Commercial Account"** means an arrangement where a retail distributor sells Hazard chemicals to a company, generally in large quantities over time and/or at costs that are below the regular retail price.



8. **"Common Name"** means any designation or identification such as code name, code number, trade name, brand name or generic name used to identify a chemical other than by its chemical name.
9. **"Container"** means any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a Hazard chemical. Pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers.
10. **"Designated Representative"** means any individual or organization that our employee gives written authorization to exercise such employee's rights. A recognized or certified collective bargaining agent will be treated automatically as a designated representative without regard to written employee authorization.
11. **"Director"** means the Director, National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designee.
12. **"Distributor"** means a business, other than a chemical manufacturer or importer that supplies Hazard chemicals to other distributors or to employers.
13. **"Employee"** means employee who may be exposed to Hazard chemicals under normal operating conditions or in foreseeable emergencies. Employees who encounter Hazard chemicals only in non-routine, isolated instances are not covered.
14. **"Employer"** means a person engaged in a business where chemicals are either used, distributed, or are produced for use or distribution, including a contractor or subcontractor.
15. **"Exposure or Exposed"** means that an employee is subjected in the course of employment to a chemical that is a physical or health hazard, and includes potential (e.g. accidental or possible) exposure. "Subjected" in terms of health hazards includes any route of entry (e.g. inhalation, ingestion, skin contact or absorption.)
16. **"Foreseeable Emergency"** means any potential occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that could result in an uncontrolled release of a Hazard chemical into the workplace.
17. **"Hazard Category"** means the division of criteria within each hazard class, e.g., oral acute toxicity and flammable liquids include four hazard categories. These categories compare hazard severity within a hazard class and should not be taken as a comparison of hazard categories more generally.
18. **"Hazard Class"** means the nature of the physical or health hazards, e.g., flammable solid, carcinogen, oral acute toxicity.
19. **"Hazard Not Otherwise Classified (HNOC)"** means an adverse physical or health effect identified through evaluation of scientific evidence during the classification process that does not meet the specified criteria for the physical and health hazard classes addressed in this section. This does not extend coverage to adverse physical and health effects for that there is a hazard class

but the effect either falls below the cut-off value/concentration limit of the hazard class or is under a GHS hazard category that has not been adopted by OSHA.

20. **"Hazard Statement"** means a statement assigned to a hazard class and category that describes the nature of the hazard(s) of a chemical, including the degree of the hazard.
21. **"Hazard Chemical"** means any chemical that is classified as a physical hazard or a health hazard, a simple combustible dust, pyrophoric gas, or hazard not otherwise classified.
22. **"Hazard Classification"** means chemical manufacturers and importers will evaluate chemicals produced in their workplaces or imported by them to classify the chemicals in accordance with this section. For each chemical, the chemical manufacturer or importer will determine the hazard classes, and where appropriate, the category of each class that apply to the chemical being classified. The company is not required to classify chemicals unless they choose not to rely on the classification performed by the chemical manufacturer or importer for the chemical to satisfy this requirement.
23. **"Health Hazard"** means a chemical that is classified as posing one of the following Hazard effects: acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); or aspiration hazard.
24. **"Immediate Use"** means that the Hazard chemical will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift where it is transferred.
25. **"Importer"** means the first business with employees within the Customs Territory of the United States that receives Hazard chemicals produced in other countries for the purpose of supplying them to distributors or other employers within the United States.
26. **"Label"** means an appropriate group of written, printed or graphic information elements concerning a Hazard chemical that is affixed to, printed on, or attached to the immediate container of a Hazard chemical, or to the outside packaging.
27. **"Label Elements"** means the specified pictogram, hazard statement, signal word and precautionary statement for each hazard class and category.
28. **"Mixture"** means a combination or a solution composed of two or more substances in that they do not react.
29. **"Physical Hazard"** means a chemical that is classified as posing one of the following Hazard effects: explosive; flammable (gases, aerosols, liquids, or solids); oxidizer (liquid, solid or gas); self-reactive; pyrophoric (liquid or solid); self-heating; organic peroxide; corrosive to metal; gas under pressure; or in contact with water emits flammable gas.
30. **"Pictogram"** means a composition that may include a symbol plus other

graphic elements, such as a border, background pattern, or color, that is intended to convey specific information about the hazards of a chemical. Eight pictograms are designated under this standard for application to a hazard category.

31. **"Precautionary Statement"** means a phrase that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a Hazard chemical or improper storage or handling.
32. **"Product Identifier"** means the name or number used for a Hazard chemical on a label or in the SDS. It provides a unique means so that the user can identify the chemical. The product identifier used will permit cross-references to be made among the list of Hazard chemicals required in the written hazard communication program, the label and the SDS.
33. **"Produce"** means to manufacture, process, formulate, blend, extract, generate, emit, or repackage.
34. **"Pyrophoric Gas"** means a chemical in a gaseous state that will ignite spontaneously in air at a temperature of 130 degrees F (54.4 degrees C) or below.
35. **"Responsible Party"** means someone who can provide additional information on the Hazard chemical and appropriate emergency procedures, if necessary.
36. **"Safety Data Sheet (SDS)"** means written or printed material concerning a Hazard chemical that is prepared in accordance with the Hazard Communication regulations.
37. **"Signal Word"** means a word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label. The signal words used in this section are "danger" and "warning." "Danger" is used for the more severe hazards, while "warning" is used for the less severe.
38. **"Simple Asphyxiate"** means a substance or mixture that displaces oxygen in the ambient atmosphere, and can thus cause oxygen deprivation in those who are exposed, leading to unconsciousness and death.
39. **"Specific Chemical Identity"** means the chemical name, Chemical Abstracts Service (CAS) Registry Number, or any other information that reveals the precise chemical designation of the substance.
40. **"Substance"** means chemical elements and their compounds in the natural state or obtained by any production process, including any additive necessary to preserve the stability of the product and any impurities deriving from the process used, but excluding any solvent that may be separated without affecting the stability of the substance or changing its composition.
41. **"Trade Secret"** means any confidential formula, pattern, process, device, information or compilation of information that is used in business, and that gives the business an opportunity to obtain an advantage over competitors who do not know or use it.

42. **"Use"** means to package, handle, react, emit, extract, generate as a byproduct, or transfer.
43. **"Work Area"** means a room or defined space in a workplace where Hazard chemicals are produced or used, and where employees are present.
44. **"Workplace"** means an establishment, job site, or project, at one geographical location containing one or more work areas.
1. **Hazard Classification:** Chemical manufacturers and importers are required to determine the hazards of the chemicals they produce or import. Hazard classification under the new, updated standard provides specific criteria to address health and physical hazards as well as classification of chemical mixtures.
2. **Labels:** Chemical manufacturers and importers must provide a label that requires the use of a safety data sheet format and provides detailed information regarding the chemical. This includes a signal word, pictogram, hazard statement, and precautionary statement for each hazard class and category.
3. **Safety Data Sheets:** The new format requires **16 specific sections** that will provide consistency in presentation of important protection information.
4. **Information and Training:** To facilitate understanding of the new system, the new standard requires that employees be trained on the new label elements and safety data sheet format, in addition to the current training requirements.

## Labeling Requirements

1. Chemical manufacturers and importers must provide a label that requires the use of a safety data sheet format and provides detailed information regarding the chemical. This includes a signal word, pictogram, hazard statement, and precautionary statement for each hazard class, category and mixed chemicals.
2. The HCS now requires the following label elements on labels of Hazard chemicals:
- a. **Name, Address and Telephone Number** of the chemical manufacturer, importer or other responsible party.
  - b. **Product Identifier** is how the Hazard chemical is identified. This can be (but is not limited to) the chemical name, code number or batch number. The manufacturer, importer or distributor can decide the appropriate product identifier. The same product identifier must be both on the label and in section 1 of the SDS.
  - c. **Signal Words** are used to indicate the relative level of severity of the hazard and alert the reader to a potential hazard on the label. There are only two










words used as signal words, “Danger” and “Warning.” Within a specific hazard class, “Danger” is used for the more severe hazards and “Warning” is used for the less severe hazards. There will only be one signal word on the label no matter how many hazards a chemical may have. If one of the hazards warrants a “Danger” signal word and another warrants the signal word “Warning,” then only “Danger” should appear on the label.

- d. **Hazard Statements** describe the nature of the hazard(s) of a chemical, including where appropriate, the degree of hazard. For example: “Causes damage to kidneys through prolonged or repeated exposure when absorbed through the skin.” All of the applicable hazard statements must appear on the label. Hazard statements may be combined where appropriate to reduce redundancies and improve readability. The hazard statements are specific to the hazard classification categories, and chemical users should always see the same statement for the same hazards no matter what the chemical is or who produces it.
  - e. **Precautionary Statements** describe recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to the Hazard chemical or improper storage or handling. There are four types of precautionary statements: prevention (to minimize exposure); response (in case of accidental spillage or exposure emergency response, and first-aid); storage; and disposal. For example, a chemical presenting a specific target organ toxicity (repeated exposure) hazard would include the following on the label: “Do not breathe dust, fumes, gas, mist, vapors, and/or spray.”
3. **Precautionary Statements** may be combined on the label to save on space and improve readability. When a chemical is classified for a number of hazards and the precautionary statements are similar, the most stringent statements must be included on the label. In this case, the chemical manufacturer, importer, or distributor may impose an order of precedence where phrases concerning response require rapid action to ensure the health and safety of the exposed person. In the self-reactive hazard category.
  4. To develop labels under the revised HCS regulations, the manufacturers, importers and distributors must first identify and classify the chemical hazard(s) by including **Pictogram(s)** on the label. After classifying the Hazard chemicals, the manufacturer, importer or distributor then determines the appropriate pictogram(s) signal words, and hazard and precautionary statement(s), for the chemical label. Once this information has been identified and gathered, then a label may be created. In most cases, the precautionary statements are independent; however, OSHA does allow flexibility for applying precautionary statements to the label, such as combining statements, using an order of precedence or eliminating an inappropriate statement.
  5. The label producer may provide supplementary Information and additional instructions or information that it deems helpful. It may also list any hazards not otherwise classified under this portion of the label. This section must also identify

the percentage of ingredient(s) of unknown acute toxicity when it is present in a concentration of  $\geq 1\%$  (and the classification is not based on testing the mixture as a whole). If the company decides to include additional information regarding the chemical that is above and beyond what the standard requires, it may list this information under what is considered "supplementary information." There is also no required format for how a workplace label must look and no particular format the company has to use; however, it cannot contradict or detract from the required information.

6. An example of an item that may be considered supplementary is the personal protective equipment (PPE) pictogram indicating what workers handling the chemical may need to wear to protect them. For example, the **Hazard Materials Information System (HMIS)** pictogram of a person wearing goggles may be listed. Other supplementary information may include directions of use, expiration date, or fill date, all of that may provide additional information specific to the process in that the chemical is used.
7. Pictograms are graphic symbols used to communicate specific information about the hazards of a chemical. On Hazard chemicals being shipped or transported from a manufacturer, importer or distributor, the required pictograms consist of a red square frame set at a point with a black hazard symbol on a white background, sufficiently wide to be clearly visible. A square red frame set at a point without a hazard symbol is not a pictogram and is not permitted on the label. The pictograms OSHA has adopted improve worker safety and health, conform to the GHS, and are used worldwide. While the GHS uses a total of nine pictograms, OSHA will only enforce the use of eight. The environmental pictogram is not mandatory but may be used to provide additional information. Employees may see the ninth symbol on a label because label preparers may choose to add the environment pictogram as supplementary information.
8. It is important to note that the OSHA pictograms do not replace the diamond shaped labels that the U.S. Department of Transportation (DOT) requires for the transport of chemicals, including chemical drums, chemical totes, tanks or other containers. Those labels must be on the external part of a shipped container and must meet the DOT requirements set forth in 49 CFR 172. While the DOT diamond label is required for all Hazard chemicals on the outside shipping containers, chemicals in smaller containers inside the larger shipped container do not require the DOT diamond but do require the OSHA pictograms.
9. The company is responsible for maintaining the labels on the containers, including, tanks, totes, and drums. This means that labels must be maintained on chemicals in a manner that continues to be legible and the pertinent information does not get defaced (i.e., fade, get washed off) or removed in any way.

## PICTOGRAMS AND HAZARDS

|  |  |   |
|--|--|---|
| <b>Health Hazard</b><br><br><ul style="list-style-type: none"> <li>• Carcinogen</li> <li>• Mutagenicity</li> <li>• Reproductive Toxicity</li> <li>• Respiratory Sensitizer</li> <li>• Target Organ Toxicity</li> <li>• Aspiration Toxicity</li> </ul> | <b>Flame</b><br><br><ul style="list-style-type: none"> <li>• Flammables</li> <li>• Pyrophorics</li> <li>• Self-Heating</li> <li>• Emits Flammable Gas</li> <li>• Self-Reactives</li> <li>• Organic Peroxides</li> </ul> | <b>Exclamation Mark</b><br><br><ul style="list-style-type: none"> <li>• Irritant (skin and eye)</li> <li>• Skin Sensitizer</li> <li>• Acute Toxicity (harmful)</li> <li>• Narcotic Effects</li> <li>• Respiratory Tract Irritant</li> <li>• Hazardous to Ozone Layer (Non-Mandatory)</li> </ul> |
| <b>Gas Cylinder</b><br><br><ul style="list-style-type: none"> <li>• Gases Under Pressure</li> </ul>  | <b>Corrosion</b><br><br><ul style="list-style-type: none"> <li>• Skin Corrosion/ Burns</li> <li>• Eye Damage</li> <li>• Corrosive to Metals</li> </ul>   | <b>Exploding Bomb</b><br><br><ul style="list-style-type: none"> <li>• Explosives</li> <li>• Self-Reactives</li> <li>• Organic Peroxides</li> </ul>   |
| <b>Flame Over Circle</b><br><br><ul style="list-style-type: none"> <li>• Oxidizers</li> </ul>   | <b>Environment<br/>(Non-Mandatory)</b><br><br><ul style="list-style-type: none"> <li>• Aquatic Toxicity</li> </ul>  | <b>Skull and Crossbones</b><br><br><ul style="list-style-type: none"> <li>• Acute Toxicity (fatal or toxic)</li> </ul>  |

## **Employee Training**

### **The 16 sections of a Safety Data Sheet (SDS)**

- 1. Identification**
- 2. Hazard identification**
- 3. Composition/Information on ingredients**
- 4. First-aid Measures**
- 5. Fire Fighting Measures**
- 6. Accidental Release Measures**
- 7. Handling and Storage**
- 8. Exposure Controls/ PPE**
- 9. Physical and Chemical Properties**
- 10. Stability and Reactivity**
- 11. Toxicological Information**
- 12. Ecological Information**
- 13. Disposal Considerations**
- 14. Transport Information**
- 15. Regulatory Information**
- 16. Other Information**



## **Respirable Crystalline Silica Program**

### **PURPOSE**

This Respirable Crystalline Silica Program was developed to prevent employee exposure to hazardous levels of Respirable Crystalline Silica that could result through construction activities or nearby construction activities occurring on worksites. Respirable Crystalline Silica exposure at hazardous levels can lead to lung cancer, silicosis, chronic obstructive pulmonary disease, and kidney disease. It is intended to meet the requirements of the Respirable Crystalline Silica Construction Standard (29 CFR 1926.1153) established by the Occupational Safety and Health Administration (OSHA).

All work involving chipping, cutting, drilling, grinding, or similar activities on materials containing Crystalline Silica can lead to the release of respirable-sized particles of Crystalline Silica (i.e. Respirable Crystalline Silica). Crystalline Silica is a basic component of soil, sand, granite and many other minerals. Quartz is the most common form of Crystalline Silica. Many materials found on construction sites include Crystalline Silica; including but not limited to – cement, concrete, asphalt, pre-formed structures (inlets, pipe, etc.) and others. Consequently, this program has been developed to address and control these potential exposures to prevent our employees from experiencing the effects of occupational illnesses related to Respirable Crystalline Silica exposure.

### **SCOPE**

This Respirable Crystalline Silica Program applies to all employees who have the potential to be exposed to Respirable Crystalline Silica when covered by the OSHA Standard. The OSHA Respirable Crystalline Silica Construction Standard applies to all occupational exposures to Respirable Crystalline Silica in construction work, except where employee exposure will remain below 25 micrograms of Respirable Crystalline Silica per cubic meter of air ( $25 \mu\text{g}/\text{m}^3$ ) as an 8-hour time-weighted average (TWA) under any foreseeable conditions.

### **RESPONSIBILITIES**

“The Joint Venture” firmly believes protecting the health and safety of our employees is everyone’s responsibility. This responsibility begins with upper management providing the necessary support to properly implement this program. However, all levels of the organization assume some level of responsibility for this program including the following positions.

## Safety Department

- Conduct job site assessments for Silica containing materials and perform employee Respirable Crystalline Silica hazard assessments in order to determine if an employee's exposure will be above  $25 \mu\text{g}/\text{m}^3$  as an 8-hour TWA under any foreseeable conditions.
- Select and implement into the project's ECP the appropriate control measures in accordance with the Construction Tasks identified in OSHA's Construction Standard Table 1; and potentially including (but not limited to) - a written Exposure Control Plan (ECP), exposure monitoring, Hazard Communication training, medical surveillance, housekeeping and others.

NOTE: OSHA's Construction Standard Table 1 is a list of 18 common construction tasks along with acceptable exposure control methods and work practices that limit exposure for those tasks.

- Ensure that the materials, tools, equipment, personal protective equipment (PPE), and other resources (such as worker training) required to fully implement and maintain this Respirable Crystalline Silica Program are in place and readily available if needed.
- Ensure that Project Managers, Site Managers, Competent Persons, and employees are educated in the hazards of Silica exposure and trained to work safely with Silica in accordance with OSHA's Respirable Crystalline Silica Construction Standard and OSHA's Hazard Communication Standard. Managers and Competent Persons may receive more advanced training than other employees.
- Maintain written records of training (for example, proper use of respirators), ECPs, inspections (for equipment, PPE, and work methods/practices), medical surveillance (under lock and key), respirator medical clearances (under lock and key) and fit-test results.
- Conduct an annual review (or more often if conditions change) of the effectiveness of this program and any active project ECP's that extend beyond a year. This includes a review of available dust control technologies to ensure these are selected and used when practical.
- Coordinate work with other employers and contractors to ensure a safe work environment relative to Silica exposure.

## **Project Manager**

- Ensure all applicable elements of this Respirable Crystalline Silica Program are implemented on the project including the selection of a Competent Person.
- Assist the Safety Department in conduct job site assessments for Silica containing materials and perform employee Respirable Crystalline Silica hazard assessments in order to determine if an ECP, exposure monitoring, and medical surveillance is necessary.
- Assist in the selection and implementation of the appropriate control measures in accordance with the Construction Tasks identified in OSHA's Construction Standard Table 1; and potentially including (but not limited to) - a written Exposure Control Plan (ECP), exposure monitoring, Hazard Communication training, medical surveillance, housekeeping and others.
- Ensure that employees using respirators have been properly trained, medically cleared, and fit-tested in accordance with the company's Respiratory Protection Program. This process will be documented.
- Ensure that work is conducted in a manner that minimizes and adequately controls the risk to workers and others. This includes ensuring that workers use appropriate engineering controls, work practices, and wear the necessary PPE.
- Where there is risk of exposure to Silica dust, verify employees are properly trained on the applicable contents of this program, the project-specific ECP, and the applicable OSHA Standards (such as Hazard Communication). Ensure employees are provided appropriate PPE when conducting such work.

## **Competent Person and/or Site Manager (Superintendent, Foreman, etc.)**

- Make frequent and regular inspections of job sites, materials, and equipment to implement the written ECP.
- Identify existing and foreseeable Respirable Crystalline Silica hazards in the workplace and take prompt corrective measures to eliminate or minimize them.
- Notify the Project Manager and/or Safety Department of any deficiencies identified during inspections in order to coordinate and facilitate prompt corrective action.
- Assist the Project Manager and Safety Department in conducting job site assessments for Silica containing materials and perform employee Respirable Crystalline Silica hazard assessments in order to determine if an ECP, exposure monitoring, and medical surveillance is necessary.

## **Employees:**

- Follow recognized work procedures (such as the Construction Tasks identified in OSHA's Construction Standard Table 1) as established in the project's ECP and this program.
- Use the assigned PPE in an effective and safe manner.
- Participate in Respirable Crystalline Silica exposure monitoring and the medical surveillance program.
- Report any unsafe conditions or acts to the Site Manager and/or Competent Person.
- Report any exposure incidents or any signs or symptoms of Silica illness.

## **DEFINITIONS**

If a definition is not listed in this section, please contact your supervisor. If your supervisor is unaware of what the term means, please contact the Competent Person or your Safety Department.

- Action Level means a concentration of airborne Respirable Crystalline Silica of  $25 \mu\text{g}/\text{m}^3$ , calculated as an 8-hour TWA.
- Competent Person means an individual who is capable of identifying existing and foreseeable Respirable Crystalline Silica hazards in the workplace and who has authorization to take prompt corrective measures to eliminate or minimize them.
- Employee Exposure means the exposure to airborne Respirable Crystalline Silica that would occur if the employee were not using a respirator.
- High-Efficiency Particulate Air (HEPA) Filter means a filter that is at least 99.97 percent efficient in removing monodispersed particles of 0.3 micrometers in diameter.
- Objective Data means information, such as air monitoring data from industry-wide surveys or calculations based on the composition of a substance, demonstrating employee exposure to Respirable Crystalline Silica associated with a particular product or material or a specific process, task, or activity. The data must reflect workplace conditions closely resembling or with a higher exposure potential than the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.
- Permissible Exposure Limit (PEL) means the employer shall ensure that no employee is exposed to an airborne concentration of Respirable Crystalline Silica in excess of  $50 \mu\text{g}/\text{m}^3$ , calculated as an 8-hour TWA.
- Physician or Other Licensed Health Care Professional (PLHCP) means an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the

particular health care services required by the Medical Surveillance Section of the OSHA Respirable Crystalline Silica Standard.

- Respirable Crystalline Silica means Quartz, Cristobalite, and/or Tridymite contained in airborne particles that are determined to be respirable by a sampling device designed to meet the characteristics for respirable-particle size- selective samplers specified in the International Organization for Standardization (ISO) 7708:1995: Air Quality-Particle Size Fraction Definitions for Health-Related Sampling.
- Specialist means an American Board Certified Specialist in Pulmonary Disease or an American Board Certified Specialist in Occupational Medicine.

## REQUIREMENTS

### Specified Exposure Control Methods

When possible and applicable, “The Joint Venture” will conduct activities involving potential Silica exposure to be consistent with OSHA’s Construction Standard Table 1. Supervisors will ensure each employee under their supervision and engaged in a task identified on OSHA’s Construction Standard Table 1 have fully and properly implemented the engineering controls, work practices, and respiratory protection specified for the task on Table 1 (unless Fontaine Bros Inc. has assessed and limited the exposure of the employee to Respirable Crystalline Silica in accordance with the Alternative Exposure Control Methods Section of this program).

The task(s) being performed by Fontaine Bros Inc. identified on OSHA’s Construction Standard Table 1 is/are: **Select any/all of the following that apply:**

Table 1: Specified Exposure Control Methods When  
Working With Materials Containing Crystalline Silica

| Construction Task or Equipment Operation |  | Engineering and Work Practice Control Methods  | Required Respiratory Protection                              |  |
|--|--|--|--|--|
|  |  |  | ≤ 4 hours/shift  | >4 hours/shift   |
| 1  | Stationary masonry saws  | <ul style="list-style-type: none"> <li>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> </ul>   | None   | None   |
| 2a                                       | Handheld power saws (any blade diameter) when used outdoors  | <ul style="list-style-type: none"> <li>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> </ul>   | None   | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask |
| 2b                                       | Handheld power saws (any blade diameter) when used indoors or in an enclosed area  | <ul style="list-style-type: none"> <li>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> </ul>   | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask |
| 3  | Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less) for tasks performed outdoors only | <ul style="list-style-type: none"> <li>Use saw equipped with commercially available dust collection system.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> <li>Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency.</li> </ul> | None   | None   |
| 4a                                       | Walk-behind saws when used outdoors  | <ul style="list-style-type: none"> <li>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> </ul>   | None   | None   |
| 4b                                       | Walk-behind saws when used indoors or in an enclosed area  | <ul style="list-style-type: none"> <li>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> </ul>   | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask |
| 5  | Drivable saws for tasks performed outdoors only  | <ul style="list-style-type: none"> <li>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> </ul>   | None   | None   |
| 6  | Rig-mounted core saws or drills  | <ul style="list-style-type: none"> <li>Use tool equipped with integrated water delivery system that supplies water to cutting surface.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> </ul>  | None   | None   |

| Construction Task or Equipment Operation |  | Engineering and Work Practice Control Methods   | Required Respiratory Protection                                 |   |
|--|--|---|---|---|
|  |  |   | ≤ 4 hours/shift   | >4 hours/shift  |
| 7  | Handheld and stand-mounted drills (including impact and rotary hammer drills)            | <ul style="list-style-type: none"> <li>Use drill equipped with commercially available shroud or cowl with dust collection system.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> <li>Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.</li> <li>Use a HEPA-filtered vacuum when cleaning holes.</li> </ul> | None  | None  |
| 8  | Dowel drilling rigs for concrete for tasks performed outdoors only                       | <ul style="list-style-type: none"> <li>Use shroud around drill bit with a dust collection system.</li> <li>Dust collector must have a filter with 99% or greater efficiency and a filter cleaning mechanism.</li> <li>Use a HEPA-filtered vacuum when cleaning holes.</li> </ul>  | N95 (or Greater Efficiency)<br>Filtering Facepiece or Half Mask | N95 (or Greater Efficiency)<br>Filtering Facepiece or Half Mask |
| 9a                                       | Vehicle-mounted drilling rigs for rock and concrete                                      | <ul style="list-style-type: none"> <li>Use dust collection system with close capture hood or shroud around drill bit with a low-flow water spray to wet the dust at the discharge point from the dust collector.</li> </ul>   | None  | None  |
| 9b                                       | Vehicle-mounted drilling rigs for rock and concrete                                      | <ul style="list-style-type: none"> <li>Operate from within an enclosed cab and use water for dust suppression on drill bit.</li> </ul>  | None  | None  |
| 10a                                      | Jackhammers and handheld powered chipping tools when used outdoors                       | <ul style="list-style-type: none"> <li>Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact.</li> </ul>   | None  | N95 (or Greater Efficiency)<br>Filtering Facepiece or Half Mask |
| 10b                                      | Jackhammers and handheld powered chipping tools when used indoors or in an enclosed area | <ul style="list-style-type: none"> <li>Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact.</li> </ul>   | N95 (or Greater Efficiency)<br>Filtering Facepiece or Half Mask | N95 (or Greater Efficiency)<br>Filtering Facepiece or Half Mask |
| 10c                                      | Jackhammers and handheld powered chipping tools when used outdoors                       | <ul style="list-style-type: none"> <li>Use tool equipped with commercially available shroud and dust collection system.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> <li>Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.</li> </ul>  | None  | N95 (or Greater Efficiency)<br>Filtering Facepiece or Half Mask |
| 10d                                      | Jackhammers and handheld powered chipping tools when used indoors or in an enclosed area | <ul style="list-style-type: none"> <li>Use tool equipped with commercially available shroud and dust collection system.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> <li>Dust collector must provide the air flow recommended by the tool manufacturer, or</li> </ul>   | N95 (or Greater Efficiency)<br>Filtering Facepiece or Half Mask | N95 (or Greater Efficiency)<br>Filtering Facepiece or Half Mask |

| Construction Task or Equipment Operation |   | Engineering and Work Practice Control Methods  | Required Respiratory Protection                              |  |
|--|---|--|--|--|
|  |   |  | ≤ 4 hours/shift  | >4 hours/shift   |
|  |   | greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.   |  |  |
| 11                                       | Handheld grinders for mortar removal (i.e., tuckpointing)                                     | <ul style="list-style-type: none"> <li>Use grinder equipped with commercially available shroud and dust collection system.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> <li>Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.</li> </ul> | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask | Powered Air-Purifying Respirator (PAPR) with P100 Filters    |
| 12a                                      | Handheld grinders for uses other than mortar removal for tasks performed outdoors only        | <ul style="list-style-type: none"> <li>Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> </ul>  | None   | None   |
| 12b                                      | Handheld grinders for uses other than mortar removal when used outdoors                       | <ul style="list-style-type: none"> <li>Use grinder equipped with commercially available shroud and dust collection system.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> <li>Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.</li> </ul> | None   | None   |
| 12c                                      | Handheld grinders for uses other than mortar removal when used indoors or in an enclosed area | <ul style="list-style-type: none"> <li>Use grinder equipped with commercially available shroud and dust collection system.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> <li>Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.</li> </ul> | None   | N95 (or Greater Efficiency) Filtering Facepiece or Half Mask |
| 13a                                      | Walk-behind milling machines and floor grinders   | <ul style="list-style-type: none"> <li>Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> </ul>   | None   | None   |
| 13b                                      | Walk-behind milling machines and floor grinders   | <ul style="list-style-type: none"> <li>Use machine equipped with dust collection system recommended by the manufacturer.</li> <li>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</li> </ul>  | None   | None   |



| Construction Task or Equipment Operation |  | Engineering and Work Practice Control Methods  | Required Respiratory Protection |                |
|--|--|--|---------------------------------|----------------|
|  |  |  | ≤ 4 hours/shift                 | >4 hours/shift |
|  |  | <ul style="list-style-type: none"> <li>Dust collector must provide the air flow recommended by the manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.</li> <li>When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes.</li> </ul>  |                                 |                |
| 14                                       | Small drivable milling machines (less than half-lane)  | <ul style="list-style-type: none"> <li>Use a machine equipped with supplemental water sprays designed to suppress dust.</li> <li>Water must be combined with a surfactant.</li> <li>Operate and maintain machine to minimize dust emissions.</li> </ul>  | None                            | None           |
| 15a                                      | Large drivable milling machines (half-lane and larger) for cuts of any depth on asphalt only   | <ul style="list-style-type: none"> <li>Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust.</li> <li>Operate and maintain machine to minimize dust emissions.</li> </ul>   | None                            | None           |
| 15b                                      | Large drivable milling machines (half-lane and larger) for cuts of four inches in depth or less on any substrate   | <ul style="list-style-type: none"> <li>Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust.</li> <li>Operate and maintain machine to minimize dust emissions.</li> </ul>   | None                            | None           |
| 15c                                      | Large drivable milling machines (half-lane and larger) for cuts of four inches in depth or less on any substrate   | <ul style="list-style-type: none"> <li>Use a machine equipped with supplemental water spray designed to suppress dust.</li> <li>Water must be combined with a surfactant.</li> <li>Operate and maintain machine to minimize dust emissions.</li> </ul>   | None                            | None           |
| 16                                       | Crushing machines  | <ul style="list-style-type: none"> <li>Use equipment designed to deliver water spray or mist for dust suppression at crusher and other points where dust is generated (e.g., hoppers, conveyers, sieves/sizing or vibrating components, and discharge points).</li> <li>Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions.</li> <li>Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote control station.</li> </ul> | None                            | None           |
| 17a                                      | Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials | <ul style="list-style-type: none"> <li>Operate equipment from within an enclosed cab.</li> </ul>   | None                            | None           |
| 17b                                      | Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during   | <ul style="list-style-type: none"> <li>When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.</li> </ul>   | None                            | None           |

| Construction Task or Equipment Operation |  | Engineering and Work Practice Control Methods  | Required Respiratory Protection |                |
|--|--|--|---------------------------------|----------------|
|  |  |  | ≤ 4 hours/shift                 | >4 hours/shift |
|  | demolition activities involving silica-containing materials  |  |                                 |                |
| 18a                                      | Heavy equipment and utility vehicles for tasks such as grading and excavating but not including demolishing, abrading, or fracturing silica-containing materials | <ul style="list-style-type: none"> <li>Apply water and/or dust suppressants as necessary to minimize dust emissions.</li> </ul>  | None                            | None           |
| 18b                                      | Heavy equipment and utility vehicles for tasks such as grading and excavating but not including demolishing, abrading, or fracturing silica-containing materials | <ul style="list-style-type: none"> <li>When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.</li> </ul> | None                            | None           |

When implementing the control measures specified in Table 1, "The Joint Venture" shall:

- For tasks performed indoors or in enclosed areas, provide a means of exhaust as needed to minimize the accumulation of visible airborne dust;
- For tasks performed using wet methods, apply water at flow rates sufficient to minimize release of visible dust;
- For measures implemented that include an enclosed cab or booth, ensure that the enclosed cab or booth:
  - Is maintained as free as practicable from settled dust;
  - Has door seals and closing mechanisms that work properly;
  - Has gaskets and seals that are in good condition and working properly;
  - Is under positive pressure maintained through continuous delivery of fresh air;
  - Has intake air that is filtered through a filter that is 95% efficient in the 0.3-10.0 µm range (e.g., MERV-16 or better); and
  - Has heating and cooling capabilities.
- Where an employee performs more than one task included on OSHA's Construction Standard Table 1 during the course of a shift, and the total duration of all tasks combined is

more than four hours, the required respiratory protection for each task is the respiratory protection specified for more than four hours per shift. If the total duration of all tasks on Table 1 combined is less than four hours, the required respiratory protection for each task is the respiratory protection specified for less than four hours per shift.

## **Alternative Exposure Control Methods**

Alternative Exposure Control Methods apply for tasks not listed in OSHA's Construction Standard Table 1, or where "The Joint Venture" cannot not fully and properly implement the engineering controls, work practices, and respiratory protection described in Table 1.

First, "The Joint Venture" will assess the exposure of each employee who is or may reasonably be expected to be exposed to Respirable Crystalline Silica at or above the Action Level in accordance with either the Performance Option or the Scheduled Monitoring Option.

- **Performance Option** – "The Joint Venture" will assess the 8-hour TWA exposure for each employee on the basis of any combination of air monitoring data or objective data sufficient to accurately characterize employee exposures to Respirable Crystalline Silica.
- **Scheduled Monitoring Option:**
  - "The Joint Venture" will perform initial monitoring to assess the 8-hour TWA exposure for each employee on the basis of one or more personal breathing zone air samples that reflect the exposures of employees on each shift, for each job classification, and in each work area. Where several employees perform the same tasks on the same shift and in the same work area, "The Joint Venture" will plan to monitor a representative fraction of these employees. When using representative monitoring, "The Joint Venture" will sample the employee(s) who are expected to have the highest exposure to Respirable Crystalline Silica.
  - If initial monitoring indicates that employee exposures are below the Action Level, "The Joint Venture" will probably discontinue monitoring for those employees whose exposures are represented by such monitoring.
  - Where the most recent exposure monitoring indicates that employee exposures are at or above the Action Level but at or below the PEL, "The Joint Venture" will repeat such monitoring within six months of the most recent monitoring.
  - Where the most recent exposure monitoring indicates that employee exposures are above the PEL, "The Joint Venture" will repeat such monitoring within three months of the most recent monitoring.
  - Where the most recent (non-initial) exposure monitoring indicates that employee exposures are below the Action Level, "The Joint Venture" will repeat such monitoring within six months of the most recent monitoring until two consecutive measurements, taken seven or more days apart, are below the Action Level, at which time "The Joint Venture" will probably discontinue monitoring for those employees whose exposures are represented by such monitoring, except when a reassessment is required. "The Joint Venture" will reassess exposures whenever a change in the production, process, control

equipment, personnel, or work practices may reasonably be expected to result in new or additional exposures at or above the Action Level, or when “The Joint Venture” has any reason to believe that new or additional exposures at or above the Action Level have occurred.

“The Joint Venture” will ensure that all Respirable Crystalline Silica samples taken to satisfy the monitoring requirements of this program and OSHA are collected by a qualified individual (i.e. a Certified Industrial Hygienist) and the samples are evaluated by a qualified laboratory (i.e. accredited to ANSI/ISO/IEC Standard 17025:2005 with respect to Crystalline Silica analyses by a body that is compliant with ISO/IEC Standard 17011:2004 for implementation of quality assessment programs).

Within five working days after completing an exposure assessment, “The Joint Venture” will individually notify each affected employee in writing of the results of that assessment or post the results in an appropriate location accessible to all affected employees.

Whenever an exposure assessment indicates that employee exposure is above the PEL, “The Joint Venture” will describe in the written notification the corrective action being taken to reduce employee exposure to or below the PEL.

Where air monitoring is performed, “The Joint Venture” will provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to Respirable Crystalline Silica. When observation of monitoring requires entry into an area where the use of protective clothing or equipment is required for any workplace hazard, “The Joint Venture” will provide the observer with protective clothing and equipment at no cost and shall ensure that the observer uses such clothing and equipment.

Once air monitoring has been performed, “The Joint Venture” will determine its method of compliance based on the monitoring data and the hierarchy of controls. “The Joint Venture” will use engineering and work practice controls to reduce and maintain employee exposure to Respirable Crystalline Silica to or below the PEL, unless “The Joint Venture” can demonstrate that such controls are not feasible. Wherever such feasible engineering and work practice controls are not sufficient to reduce employee exposure to or below the PEL, “The Joint Venture” will nonetheless use them to reduce employee exposure to the lowest feasible level and shall supplement them with the use of respiratory protection.

In addition to the requirements of this program, “The Joint Venture” will comply with other programs and OSHA standards (such as 29 CFR 1926.57 [Ventilation]), when applicable where abrasive blasting is conducted using Crystalline Silica-containing blasting agents, or where abrasive blasting is conducted on substrates that contain Crystalline Silica.

## **Control Methods**

“The Joint Venture” will provide control methods that are either consistent with Table 1 or otherwise minimize worker exposures to Silica. These exposure control methods can include engineering controls, work practices, and respiratory protection. Listed below are control methods to be used when Table 1 is not followed:

## **List Control Methods**

### **Respiratory Protection**

Where respiratory protection is required by this program, "The Joint Venture" will provide each employee an appropriate respirator that complies with the requirements of the company's Respiratory Protection Program and the OSHA Respiratory Protection Standard (29 CFR 1910.134).

Respiratory protection is required where specified by the OSHA Construction Standard Table 1, for tasks not listed in Table 1, or where the company has not fully and properly implemented the engineering controls, work practices, and respiratory protection described in Table 1. Situations requiring respiratory protection include:

- Where exposures exceed the PEL during periods necessary to install or implement feasible engineering and work practice controls;
- Where exposures exceed the PEL during tasks, such as certain maintenance and repair tasks, for which engineering and work practice controls are not feasible; and
- During tasks for which an employer has implemented all feasible engineering and work practice controls and such controls are not sufficient to reduce exposures to or below the PEL.

### **Housekeeping**

"The Joint Venture" does not allow dry sweeping or dry brushing where such activity could contribute to employee exposure to Respirable Crystalline Silica unless wet sweeping, HEPA-filtered vacuuming, or other methods that minimize the likelihood of exposure are not feasible.

"The Joint Venture" does not allow compressed air to be used to clean clothing or surfaces where such activity could contribute to employee exposure to Respirable Crystalline Silica unless:

- The compressed air is used in conjunction with a ventilation system that effectively captures the dust cloud created by the compressed air; or
- No alternative method is feasible.

### **Written Exposure Control Plan**

When employee exposure on a construction project is expected to be at or above the Action Level, a Written Exposure Control Plan (ECP) will be established and implemented. This ECP will contain at least the following elements:

- A description of the tasks in the workplace that involve exposure to Respirable Crystalline Silica;

- A description of the engineering controls, work practices, and respiratory protection used to limit employee exposure to Respirable Crystalline Silica for each task;
- A description of the housekeeping measures used to limit employee exposure to Respirable Crystalline Silica; and
- A description of the procedures used to restrict access to work areas, when necessary, to minimize the number of employees exposed to Respirable Crystalline Silica and their level of exposure, including exposures generated by other employers or sole proprietors.

The written ECP will designate a Competent Person to make frequent and regular inspections of job sites, materials, and equipment to ensure the ECP is implemented.

The written ECP will be reviewed at least annually to evaluate the effectiveness of it and update it as necessary. Having said this, ECP's are project specific and most project durations do not exceed a year. The written ECP will be readily available for examination and copying, upon request, to each employee covered by this program and/or ECP, their designated representatives, and OSHA.

## **Medical Surveillance**

Medical surveillance will be made available for each employee who will be required to use a respirator for 30 or more days per year due to their Respirable Crystalline Silica exposure. Medical surveillance (i.e. medical examinations and procedures) will be performed by a PLHCP and provided at no cost to the employee at a reasonable time and place.

"The Joint Venture" will make available an initial (baseline) medical examination within 30 days after initial assignment, unless the employee has received a medical examination that meets the requirements of the OSHA Respirable Crystalline Silica Construction Standard within the last three years. The examination shall consist of:

- A medical and work history, with emphasis on past, present, and anticipated exposure to Respirable Crystalline Silica, dust, and other agents affecting the respiratory system in addition to any history of respiratory system dysfunction, including signs and symptoms of respiratory disease (e.g., shortness of breath, cough, wheezing), history of tuberculosis, and smoking status and history;
- A physical examination with special emphasis on the respiratory system;
- A chest X-ray (a single postero-anterior radiographic projection or radiograph of the chest at full inspiration recorded on either film [no less than 14 x 17 inches and no more than 16 x 17 inches] or digital radiography systems) interpreted and classified according to the International Labour Office (ILO) International Classification of Radiographs of Pneumoconiosis by a NIOSH-certified B Reader;
- A pulmonary function test to include forced vital capacity (FVC) and forced expiratory volume in one second (FEV1) and FEV1/FVC ratio, administered by a spirometry technician with a current certificate from a NIOSH-approved spirometry course;

- Testing for latent tuberculosis infection; and
- Any other tests deemed appropriate by the PLHCP.

“The Joint Venture” will make available medical examinations that include the aforementioned procedures (except testing for latent tuberculosis infection) at least every three years. If recommended by the PLHCP, periodic examinations can be more frequently than every three years.

“The Joint Venture” will ensure that the examining PLHCP has a copy of the OSHA Respirable Crystalline Silica Construction Standard, this program, and the following information:

- A description of the employee's former, current, and anticipated duties as they relate to the employee's occupational exposure to Respirable Crystalline Silica;
- The employee's former, current, and anticipated levels of occupational exposure to Respirable Crystalline Silica;
- A description of any personal protective equipment (PPE) used or to be used by the employee, including when and for how long the employee has used or will use that equipment; and
- Information from records of employment-related medical examinations previously provided to the employee and currently within the control of “The Joint Venture”

“The Joint Venture” will ensure that the PLHCP explains to the employee the results of the medical examination and provides each employee with a written medical report within 30 days of each medical examination performed. The written report shall contain:

- A statement indicating the results of the medical examination, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to Respirable Crystalline Silica and any medical conditions that require further evaluation or treatment;
- Any recommended limitations on the employee's use of respirators;
- Any recommended limitations on the employee's exposure to Respirable Crystalline Silica; and;
- A statement that the employee should be examined by a Specialist if the chest X-ray is classified as 1/0 or higher by the B Reader, or if referral to a Specialist is otherwise deemed appropriate by the PLHCP.

“The Joint Venture” will also obtain a written medical opinion from the PLHCP within 30 days of the medical examination. The written opinion shall contain only the following in order to protect the employee's privacy:

- The date of the examination;

- A statement that the examination has met the requirements of the OSHA Respirable Crystalline Silica Construction Standard; and
- Any recommended limitations on the employee's use of respirators.

If the employee provides written authorization, the written opinion shall also contain either or both of the following:

- Any recommended limitations on the employee's exposure to Respirable Crystalline Silica; and/or
- A statement that the employee should be examined by a Specialist if the chest X-ray is classified as 1/0 or higher by the B Reader, or if referral to a Specialist is otherwise deemed appropriate by the PLHCP.

If the PLHCP's written medical opinion indicates that an employee should be examined by a Specialist, "The Joint Venture" will make available a medical examination by a Specialist within 30 days after receiving the PLHCP's written opinion. "The Joint Venture" will ensure that the examining Specialist is provided with all of the information that the employer is obligated to provide to the PLHCP.

"The Joint Venture" will ensure that the Specialist explains to the employee the results of the medical examination and provides each employee with a written medical report within 30 days of the examination. The written report will contain:

- A statement indicating the results of the medical examination, including any medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to Respirable Crystalline Silica and any medical conditions that require further evaluation or treatment;
- Any recommended limitations on the employee's use of respirators; and
- Any recommended limitations on the employee's exposure to respirable crystalline Silica.

In addition, "The Joint Venture" will obtain a written opinion from the Specialist within 30 days of the medical examination. The written opinion shall contain the following:

- The date of the examination;
- Any recommended limitations on the employee's use of respirators; and
- If the employee provides written authorization, the written opinion shall also contain any recommended limitations on the employee's exposure to Respirable Crystalline Silica.



## **Hazard Communication**

“The Joint Venture” will include Respirable Crystalline Silica in the company’s Hazard Communication Program established to comply with the OSHA Hazard Communication Standard (29 CFR 1910.1200).

“The Joint Venture” will ensure that each employee has access to labels on containers of Crystalline Silica and those containers respective Safety Data Sheets (SDS’s).

All employees will be trained in accordance with the provisions of the OSHA Hazard Communication Standard and the Training Section of this program. This training will cover concerns relating to cancer, lung effects, immune system effects, and kidney effects.

“The Joint Venture” will ensure that each employee with the potential to be exposed at or above the Action Level for Respirable Crystalline Silica can demonstrate knowledge and understanding of at least the following:

- The health hazards associated with exposure to Respirable Crystalline Silica;
- Specific tasks in the workplace that could result in exposure to Respirable Crystalline Silica;
- Specific measures “The Joint Venture” has implemented to protect employees from exposure to Respirable Crystalline Silica, including engineering controls, work practices, and respirators to be used;
- The contents of the OSHA Respirable Crystalline Silica Construction Standard;
- The identity of the Competent Person designated by “The Joint Venture”; and
- The purpose and a description of the company’s Medical Surveillance Program.

“The Joint Venture” will make a copy of the OSHA Respirable Crystalline Silica Construction Standard readily available without cost to any employee who requests it.

## **Recordkeeping**

“The Joint Venture” will make and maintain an accurate record of all exposure measurements taken to assess employee exposure to Respirable Crystalline Silica. This record will include at least the following information:

- The date of measurement for each sample taken;
- The task monitored;
- Sampling and analytical methods used;
- Number, duration, and results of samples taken;

- Identity of the laboratory that performed the analysis;
- Type of personal protective equipment (PPE), such as respirators, worn by the employees monitored; and
- Name, social security number, and job classification of all employees represented by the monitoring, indicating which employees were actually monitored.

“The Joint Venture” will ensure that exposure records are maintained and made available in accordance with 29 CFR 1910.1020. Exposure records will be kept for at least 30 years.

The employer shall make and maintain an accurate record of all objective data relied upon to comply with the requirements of the OSHA Respirable Crystalline Silica Construction Standard. This record shall include at least the following information:

- The Crystalline Silica-containing material in question;
- The source of the objective data;
- The testing protocol and results of testing;
- A description of the process, task, or activity on which the objective data were based; and
- Other data relevant to the process, task, activity, material, or exposures on which the objective data were based.

“The Joint Venture” will ensure that objective data are maintained and made available in accordance with 29 CFR 1910.1020. Objective data records will be kept for at least 30 years.

“The Joint Venture” will make and maintain an accurate record for each employee enrolled in the Medical Surveillance portion of this program. The record shall include the following information about the employee:

- Name and social security number;
- A copy of the PLHCPs' and/or Specialists' written medical opinions; and
- A copy of the information provided to the PLHCPs and Specialists.

“The Joint Venture” will ensure that medical records are maintained and made available in accordance with 29 CFR 1910.1020. Medical records will be kept under lock and key for at least the duration of employment plus 30 years. It is necessary to keep these records for extended periods because Silica-related diseases such as cancer often cannot be detected until several decades after exposure. However, if an employee works for an employer for less than one year, the employer does not have to keep the medical records after employment ends, as long as the employer gives those records to the employee.

## **PROGRAM EVALUATION**

This program will be reviewed and evaluated on an annual basis by the Safety Department unless changes to operations, the OSHA Respirable Crystalline Silica Construction Standard (29 CFR 1926.1153), or another applicable OSHA Standard require an immediate re-validation of this program.

## **Asbestos**

It is the responsibility of each contractor and sub-contractor to determine the presence of hazardous materials and invoke safe work practices meeting all federal, state, and local mandates regarding disturbing, handling, removing, storage, and disposing of same.

Based on information available, it has been determined that this site has;

X Asbestos

No Asbestos

Possibility of  
Asbestos

Asbestos may be found in the following locations on this project;

☐ Boilers and Heating Systems

☐ Ceiling tiles

☐ Floor tile(s)

☐ Glue daubs

☐ Window caulking and glazing

☐ Linoleum and cove base

☐ Pipe insulation

☐ Plaster

☐ Roofing adhesives, flashing and membranes

☐ Sheetrock and joint compound

- Although some materials can be identified as non-asbestos by touch (such as fiberglass), the only way to confirm whether or not the material is non-asbestos is to test it.
- All material that has not been tested, but has the possibility of being asbestos must be treated as "presumed asbestos containing material" or PACM
- Review any survey that has been done by the facility for the project.

## **Lead**

Lead contaminated materials, including glazed blocks and tiles, paints, plumbing and stains may be present on site.

- The following materials has tested positive for lead on this project;

☐ **Wood**      ☐ **Glazed Block**      ☐ **Glazed Tile**      ☐ **Paint**      ☐ **Steel**

- Lead containing materials shall be properly removed and disposed of using lead safe work practices.
  - Lead contaminated wastes shall not be discarded into a construction dumpster, as the level of lead may exceed a TCLP (*Toxicity Characteristic Leaching Procedure*) test, rendering the dumpster contaminated and unable to be disposed of, except at an approved lead landfill, with appropriate documentation.
- “The Joint Venture”, with the permission of the owner or owner's representative, is responsible for the safe removal and disposal of all lead containing materials.

For this project, the contact person for lead safe work practices and disposal requirements is;

## **Cranes, Derricks, Hoists and Lifts**

- All cranes derricks and lifts shall comply with the requirements of OSHA Final Rule effective date November 8, 2010 (Subpart CC.)
  - “The Joint Venture”, working with the crane operator shall insure that a “competent” person has been appointed to act as the person-in-charge for all lifts involving cranes, regardless of size and/or weight capacity.

The person-in-charge is required to have a pre-lift plan for regulatory and safety reasons. The plan must include, but is not limited to the following requirements;

- The operators name and proof of certification, as well as the signaler name and verification of training
- Area survey to ensure that the work site is stable and appropriate for the weight and work activities of the crane
- Description, type and rated capacity of the crane being used for the lift
- The list of the equipment or material being lifted, including weight, dimensions and other applicable information
- Appropriate sketches or blueprints of how the material will be lifted.
- Boom and swing angles, crane orientations, lifting points, methods of attachment and rated capacity.
- A pre-lift meeting with all personnel that will be involved with the lift, or in close proximity to same.

“The Joint Venture” or their designee is required to barricade or provide warnings to alert persons in close proximity about the overhead work. This shall include, but is not limited to;

- protection of doorways and exits, which might include redirection to an alternative entrance / exit
- tape off hazardous areas, including swing zones and areas where overhead hazards are likely to fall
- Inspections of cranes, derricks and associated attachments shall be made by a competent person prior to each use

Crane Operators are responsible for operations under their direct control. They shall;

- Not engage in any practice that will divert their attention while operating the hoisting equipment
- Not operate the lift if their operation is / might be impaired (mentally or physically)
- Perform an equipment assessment (walk around inspection) to verify personnel, equipment and site safety
- Place appropriate barriers or warning lines around the superstructure to prevent unauthorized entry into the site / area of swing
- Test all controls and emergency stops
  - improperly functioning / working controls must be adjusted / repaired before the equipment is used.
  - If not repairable, the unit must be removed from service and locked and / or tagged "Out Of Service DO Not Use".

- Respond appropriately to any signals from a trained "signalperson", or by radio or phone contact (hands-free).
- Be responsible for anyone working under their direct control, and shall stop any unsafe or potential unsafe operation until corrections can be made
- Secure and make safe any unattended hoisting equipment
- Not permit any person to work under the boom or suspended load

A competent, authorized and properly trained person shall inspect cranes, derricks and associated equipment, as specified by the manufacturer, prior to each use.

- Crane operators are responsible for their cranes and derricks before, during and after any lift.
  - If the safety of the personnel, equipment or facility is in question, the competent person shall;
    - Stop all hoist activities
    - Refuse to handle or lift non-conforming loads

Hoisting employees on a personal platform of cranes and derricks, when steel erection is being conducted is permitted, provided that all provisions of 29 CFR 1926.550 [except 1926.550(g)(2)] are met.

- Headache balls cannot be used to transport personnel
- Safety latches on crane hooks (regardless of hook capacity and size) shall not be deactivated, removed or disabled
- Crane Inspections shall;
  - Be performed by a competent person and shall include all aspects, as specified by the manufacturer of the crane.
  - **A qualified rigger must be used during all rigging and hoisting operations**

Use of cranes, including lifting procedures, assembling and disassembling shall be done in accordance with manufactures specifications.

## **Demolition: Subpart T**

**A Written Demolition Plan must be submitted and approved prior to building demolition.**

- All demolition work, which creates dust (regardless of type), shall incorporate the use of dust control methods, such as a water spray, or other engineering controls to limit dust migration. The use of HEPA Vacuums will be used in conjunction with 6mil poly barriers to control airborne dust concentrations as needed.

### **Demolition Safety Tips**

Demolition work involves many of the same hazards that arise during other construction activities. However, demolition also involves additional hazards due to a variety of other factors. Some of these include: lead-based paint, sharp or protruding objects and asbestos-containing material.

### **Preventing Falls**

- Brace or shore up the walls and floors of structures which have been damaged and which employees must enter.
- Inspect personal protective equipment (PPE) before use.
- Select, wear and use appropriate PPE for the task.
- Inspect all stairs, passageways, and ladders; illuminate all stairways.
- Shut off or cap all electric, gas, water, steam, sewer, and other service lines; notify appropriate utility companies.
- Guard wall openings to a height of 42 inches; cover and secure floor openings with material able to withstand the loads likely to be imposed.
- Floor openings used for material disposal must not be more than 25% of the total floor area.
- Use enclosed chutes with gates on the discharge end to drop demolition material to the ground or into debris containers.
- Demolition of exterior walls and floors must begin at the top of the structure and proceed downward.
- Structural or load-supporting members on any floor must not be cut or removed until all stories above that floor have been removed.
- All roof cornices or other ornamental stonework must be removed prior to pulling walls down.
- Employees must not be permitted to work where structural collapse hazards exist until they are corrected by shoring, bracing, or other effective means.



## IAQ Indoor Air Quality Management Program

Incorporate indoor air quality goals into the construction process.

Ensure that all members of the construction project team are knowledgeable about indoor quality issues and have defined responsibilities for implementation of good indoor air quality practices.

Require the development and use of this indoor air quality management plan. The purpose of the management plan is to prevent residual problems with indoor air quality in the completed building and protect workers on the site from undue health risks during construction. The plan should identify specific measures to address:

- Problem substances, including: construction dust, chemical fumes, off-gassing materials, and moisture. The plan should ensure that these problems are not introduced during construction, or, if they must be, eliminates or reduces their impact.
- Areas of planning, including: product substitutions and materials storage, safe installation, proper sequencing, regular monitoring, and safe and thorough cleanup.

**Conduct regular inspection and maintenance of indoor air quality measures including ventilation system protection and ventilation rate.**

**Conduct safety meetings, develop signage, and establish subcontractor agreements that communicate the goals of the construction indoor air quality plan.** The indoor air quality construction plan is also a good opportunity to proscribe behaviors unacceptable to the owner that represent a potentially negative impact on long term indoor air quality such as smoking, using chew tobacco, or wearing contaminated work clothes.

**Require contractors to provide information on product substitutions sufficient to enable operations and maintenance staff to properly maintain and repair materials in place.**

### Construction Practices

During construction, there are several simple actions contractors can perform that will minimize the potential for indoor air quality problems. Trades that need to be especially careful include: flooring, roofing, painting, drywall, HVAC, insulators, and the clean-up crew.

**Keep building materials dry.** Building materials, especially those with moisture absorbing properties like wood, insulation, paper, and fabric, should be kept dry to prevent the growth of mold and bacteria. If moisture is present, mold will grow on any virtually any material. Some building materials such as wood may arrive at the construction site with a high- moisture content or may have been wetted before arrival or during the transport process. Wet materials need to be allowed to dry as much as possible as weather permits. Cover dry materials with plastic to prevent rain damage, and if resting on the ground, use spacers to allow air to circulate between the ground and the materials.

**Dry water damaged materials quickly.** Water damaged materials should be dried within 24 hours. Due to the possibility of mold growth, materials that are damp or wet for more than 72 hours may need to be discarded.

**Clean spills immediately.** If solvents, cleaners, gasoline, or other odorous or potentially toxic liquids are spilled onto the floor, they should be cleaned up immediately. If a spill occurs on an

easily replaced building material, it may be safest to discard it and replace it with new material. Odors from significant spills can linger sometimes for years, causing comfort and health problems for the future occupants of the building.

**Seal unnecessary openings.** Seal all unnecessary openings in walls, floors, and ceilings that separate conditioned space (heated or cooled) from unconditioned space. For example, it is common to punch large holes in the floor to allow pipes and wires to run between the rooms above and the crawlspaces or tunnels below. These oversized openings can cause two significant indoor air quality problems. Air that is contaminated with mold, radon, moisture, and pesticides can easily enter the rooms; and pests such as roaches or rodents can enter the rooms, leaving behind odors and allergens.

**Temporarily seal duct-work.** As duct-work is being installed, all return and supply air vents and any open duct-work should be temporarily sealed to prevent the duct-work and air handling units from being contaminated with construction debris or dust.

**Ventilate when needed.** Some construction activities can release large amounts of VOCs into the building, and if the building is already enclosed with walls, windows, and doors, outdoor air can no longer easily flow through the building and remove the VOCs. In addition to affecting the health of the construction workers, these VOCs can also be adsorbed onto other building materials and be re-released into the air later when the building is occupied by children and staff. During certain construction activities, temporary ventilation systems should be installed to quickly remove the gases.

Ventilation is generally needed when "wet" building materials are in use, when using materials that give off an odor, or when using materials that carry a manufacturer's warning regarding the need for ventilation. Odors from building materials are the result of chemicals being released from the materials into the air, so if there is an odor present, it is safest to provide ventilation that will quickly remove those odors from the building. Examples of potentially problematic construction activities include painting (even with no- or low-VOC paints), spreading of floor adhesives, and use of large amounts of caulk, sealants, and cleaning agents. Additionally, the installation of large amounts of building materials, such as carpet or vinyl-based flooring products and composite wood cabinets and shelves, can require extra ventilation if the material has not been carefully selected or aired-out before being unrolled or unpackaged within the building.

**During installation of carpet, paints, furnishings, and other VOC-emitting products, provide supplemental (spot) ventilation for at least 72 hours after work is completed.**

It is important that an exhaust fan be used to pull the polluted air out of the building, not to push outdoor air into the building. Simply opening windows or doors is not enough to effectively exhaust contaminants in most cases. The fan should be placed in a window or exterior door as close to the work area as possible, and any openings in the window or door around the fan be temporarily sealed with plastic or cardboard. Then open a window or exterior door at the opposite end of the room or building, so that fresher outdoor air will flow across the work area and sweep polluted air out through the exhaust fan. The size of exhaust fan needed will increase as the size of the room increases, and as the amount of gases being released into the air increases. The fan should provide about 5 air changes per hour (5 ACH). Divide the volume of the room in cubic feet by 12 to get the minimum amount of cubic feet per minute (CFM) that the fan must be able to exhaust. For example, a room with a volume of 9000 cubic feet (1000 square feet of floor area with 9 foot ceilings) divided by 12 results in a fan of 750 CFM. A 21 inch box fan may be sufficient for a single room if the materials are not too strong a source of gases, but would certainly not be sufficient for a wing or a whole

building. As a rule of thumb, there may be enough airflow if odors do not spread out of the immediate area where the work is being performed, if dust or smoke released into the air can be seen to be drawn towards the exhaust fan. As long as the odors or air pollutants are present, the temporary exhaust ventilation must continue to be operated, even during nights and weekends if necessary. Ventilation should continue for a minimum of 24 hours after completion, or until there are no longer any noticeable odors.

**Barriers** are to be installed to prevent dust mitigation into occupied areas. The barriers will be made from 6mil poly held into place with tensioners or high quality duct-tape.

A negative pressure will be created in the work zone using one or more negative pressure ventilation machines. The filter media on each machine will be inspected and replaced at regular intervals.

**Reduce construction dust.** Minimize the amount of dust in the air and on surfaces. Examples include use of vacuum assisted drywall sanding equipment, and use of vacuums instead of brooms to clean construction dust from floors.

**Use wet sanding for gypsum board assemblies when possible.**

**Exception:** Dry sanding is acceptable if the following measures are taken:

- Full isolation of space under finishing
- Vacuum systems are used
- Plastic protection sheeting is installed to provide air sealing during the sanding
- Closure of all air system devices and ductwork
- Sequencing of construction precludes the possibility of contamination of other spaces with gypsum dust
- Worker protection is provided. Use safety meetings, signage, and subcontractor agreements to communicate the goals of the construction indoor air quality plan.

**Avoid use of combustion equipment indoors.** Engines and heaters that run on gasoline, diesel, kerosene, or other fossil fuels should not be operated indoors unless absolutely necessary, and only when large quantities of exhaust ventilation are provided to remove combustion pollutants such as carbon monoxide and moisture.

**Store liquids outdoors.** To reduce the possibility of spills during storage, transfer, or mixing, store all odorous or toxic liquids outside the building and protect against freezing.

**Smoking** will only be allowed in designated areas. No exceptions.

**Use less toxic cleaning agents.** Ensure that the cleaning crews do not use highly toxic or odorous cleaning agents inside the building.

## **RESPIRATORY PROTECTION PROGRAM**

### **Policy Statement**

To control and or minimize the threat of occupational diseases caused by breathing air contaminated with harmful dusts, fumes, mists, gases, smokes, sprays, or vapors, the primary objective of this program shall be to prevent atmospheric contamination.

This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic substance). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used.

### **Written Program**

Effective implementation of this program requires support from all levels of management within "The Joint Venture". This written program will be communicated to all personnel that are affected by it. It encompasses the total workplace, regardless of the number of workers employed or the number of work shifts. It is designed to establish clear goals, and objectives.

### **Medical Evaluations**

All contractors shall provide a medical evaluation to determine the employee's ability to use a respirator. "The Joint Venture" shall identify a physician or other licensed health care professional to perform medical evaluations using a medical questionnaire and an initial medical examination.

### **Employer and Employee Responsibility**

#### **Employer's Responsibility**

Respirators shall be provided by the respective employer when they are necessary to protect employee's health.

The respirator provided shall be suitable for the intended use,

Each contractor shall be responsible for establishing and maintaining a respiratory program whenever respirators are used.

#### **Employee's Responsibility**

The employee shall use the respiratory protection in accordance with instructions and training received or contracted by their employer.

The employee shall guard against damage to the respirator, and immediately replace suspect respirators.

The employee shall report any trouble with or malfunction of the respirator to his/her Foreman.

## Respirators

Respirators shall be provided by the respective employer when such equipment is necessary to protect the health of the employees:

### Contractors shall:

- Provide the respirators, which are applicable and suitable for the purpose intended.
- **Be responsible for the establishment and maintenance of a written respiratory protection program.**
- The employee shall use the provided respiratory protection in accordance with instructions and training received.
- Respirators shall be selected on the basis of hazards to which the worker is exposed.
- The user shall be instructed and trained in the proper use of respirators and their limitations.
- Respirators shall be regularly cleaned and disinfected. Those worn by more than one worker shall be thoroughly cleaned and disinfected after each use.
- Respirators shall be stored in a convenient, clean, and sanitary location.
- Respirators used routinely shall be inspected during cleaning. Worn or deteriorated parts shall be replaced. Respirators for emergency use such as self-contained devices shall be thoroughly inspected at least once a month and after each use.
- Appropriate surveillance of work area conditions and degree of employee exposure or stress shall be maintained.
- There shall be regular inspection and evaluation to determine the continued effectiveness of the program.
- Employees will not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. A physician shall determine what health and physical conditions are pertinent. The respirators user's medical status will be reviewed on a periodic basis.
- NIOSH approved or accepted respirators shall be used when they are available. The respirator furnished shall provide adequate respiratory protection against the particular hazard for which it is designed.

## Confined Space Entry

### ASSIGNMENT OF RESPONSIBILITY

Typically, while performing work on a construction site, the Company may serve in the role of an Entry Employer or as the Host Employer or Controlling Contractor, as defined herein. The following outlines the Assignment of Responsibilities as well as guidance and recommendations pertaining to each of these roles.

**Company Policy:** *When the scale of the project is such that Host Employer does not possess confined space entry resources and the requirements of the OSHA regulation are beyond the capability of the Company, contracting the confined space entry work to a qualified entity that has this capability is highly recommended to ensure the health and safety of the Company's workers is protected.*

The effectiveness of this program depends on **proactive engagement and communication** of construction site management and employees. Before work begins at a construction site, each employer must ensure that a competent person identifies all confined spaces in which one or more of the employees it directs may work and identifies each space that is a permit space, through consideration and evaluation of the elements of that space, including testing as necessary.

If any employer conducting work on a construction site decides that employees it directs will enter a permit space, that employer (Entry Employer) must have a written permit space program implemented at the construction site. A written program, as outlined here, must be made available prior to and during entry operations for inspection by employees and their authorized representatives.

Interaction and information sharing with client facility representatives, general contractors and all related trade contractors is critical to this construction confined space process since hazards may be part of the jobs, tasks, and processes being completed by these multi-employer work environments. Clients may have confined spaces in their facilities or on active construction sites and it is important the Company work closely with these related organizations to identify these areas and take proper precautions.

This program (and the OSHA standard) is dependent upon the Controlling Contractor, rather than the Host Employer or Entry Employer, be the primary point of contact for information about permit spaces at the work site. The Host Employer must provide information it has about permit spaces at the work site to the Controlling Contractor, who then passes it on to the employers whose employees will enter the spaces (deemed "Entry Employers").

Likewise, Entry Employers must give the Controlling Contractor information about their entry program and hazards they encounter in the space and the Controlling Contractor passes that information on to other Entry Employers and back to the Host Employer.

The Controlling Contractor is also responsible for making sure employers outside a space know not to create hazards in the space and that Entry Employers working in a space at the same time do not create hazards for one another's workers.

**Note:** *If there is no Controlling Contractor, the Host Employer or another employer will perform these duties; or if the Controlling Contractor owns or manages the property, then it is both a Controlling Contractor also serves as the Host Employer.*

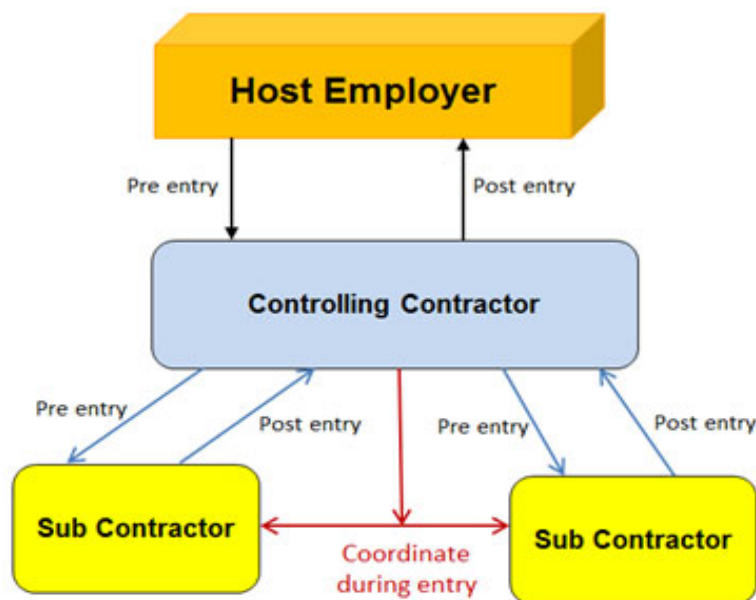
Before entry operations begin, the Controlling Contractor must:

- Obtain the Host Employer's information about the permit space hazards and previous entry operations; and
- Provide the following information to each entity entering a permit space and any other entity at the worksite whose activities could foreseeably result in a hazard in the permit space:
  - The information received from the Host Employer;
  - Any additional information the Controlling Contractor has about the subjects the Host Employer is responsible for listed above; and
  - The precautions that the Host Employer, Controlling Contractor, or other Entry Employers implemented for the protection of employees in the permit spaces.

If the workplace contains one or more permit spaces, the Host Employer responsibilities include:

- Before entry operations begin, the Host Employer must provide the following information to the Controlling Contractor if available:
  - The location of each known permit space and inform exposed employees by posting signs reading "DANGER – PERMIT REQUIRED CONFINED SPACE, DO NOT ENTER" providing sufficient notification of the existence and location of, and danger posed by each permit space.
  - Inform, in a timely manner and in a manner other than posting, its employees' authorized representatives and Controlling Contractor of the existence and location of, and the danger posed by, each permit space.
  - The hazards or potential hazards in each space or the reason it is a permit space; and
  - Any precautions that the Host Employer or any previous Controlling Contractor or Entry Employer implemented for the protection of employees in the permit space.

The following diagram should help to illustrate this flow of communication requirements, their assigned responsibilities within this program and the critical relationships between these key roles.



The Company Safety Manager is responsible for:

- Providing oversight and technical support,
- Securing the resources necessary to implement this program;
- Ensuring that routine safety checks of work operations are performed;
- Conducting an annual review of this program;
- Updates (as needed) to ensure the effectiveness of the program; and,
- Ensuring that proper reporting and record keeping is executed.

**The Entry Supervisor is the Company *qualified person*** (such as the site supervisor, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this standard. **Note:** An entry supervisor may also serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required by this standard for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.

Specifically, the Entry Supervisor is responsible for:

- Assessing the space prior to entry to determine if the space meets the characteristics of a permit-required confined space;
- Knowing space hazards including information on the mode of exposure, signs, or symptoms and consequences of exposure;
- Verifying emergency plans and specified entry conditions such as permits, tests, procedures, equipment, and availability of rescue services before allowing entry;
- Terminating entry and canceling permits when entry operations are complete or if a new condition exists;
- Taking appropriate measures to remove unauthorized entrants; and,
- Ensuring that entry operations remain consistent with the entry permit and acceptable entry conditions are maintained.



The Authorized Entrant is the properly trained employee who has been authorized by the Entry Supervisor to enter a permit space. Specifically, the Authorized Entrant is responsible for:

- Knowing the hazards that may be faced during entry, including information on the mode, signs, or symptoms, and consequences of the exposure;
- Properly using equipment as required;
- Communicating with the Attendant during the entry so that the Attendant can monitor the status of the entry;
- Exiting from the permit space as soon as possible when ordered by the Attendant, when the entrant recognizes the warning signs or symptoms of exposure exists, when a prohibited condition exists, or when an automatic alarm is activated; and,
- Alert the Attendant immediately when a prohibited condition exists or when warning signs or symptoms of exposure exist.

The Attendant is an individual stationed outside one or more permit spaces who assesses the status of authorized entrants and who must perform the following duties:

- Is familiar with and understands the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
- Is aware of possible behavioral effects of hazard exposure in authorized entrants;
- Continuously maintains and ensures an accurate count of Authorized Entrants in the permit space;
- Remains outside the permit space during entry operations until relieved by another attendant; Note: Once an Attendant has been relieved by another Attendant, the relieved attendant may enter a permit space to attempt a rescue when the employer's permit space program allows attendant entry for rescue and the Attendant has been trained and equipped for rescue operations.
- Communicates with authorized entrants as necessary to assess entrant status and to alert entrants of the need to evacuate the space;
- Assesses activities and conditions inside and outside the space to determine if it is safe for entrants to remain in the space and orders the Authorized Entrants to evacuate the permit space immediately under any of the following conditions:
  - If there is a prohibited condition;
  - If the behavioral effects of hazard exposure are apparent in an authorized entrant;
  - If there is a situation outside the space that could endanger the authorized entrants;
  - or
  - If the Attendant cannot effectively and safely perform all the duties as required under this standard;
- Summons rescue and other emergency services as soon as the Attendant determines that authorized entrants may need assistance to escape from permit space hazards;
- Takes the following actions when unauthorized persons approach or enter a permit space while entry is underway:
  - Warns the unauthorized persons that they must stay away from the permit space;
  - Advises the unauthorized persons that they must exit immediately if they have entered the permit space; and
  - Informs the Authorized Entrants and the entry supervisor if unauthorized persons have entered the permit space;
- Performs non-entry rescues as specified by the employer's rescue procedure; and
  - Performs no duties that might interfere with the Attendant's primary duty to assess and protect the Authorized Entrants.

### Confined Space Entry Permit

This permit must remain at job site until the entry is completed

Project Address: \_\_\_\_\_ Project No: \_\_\_\_\_  
 Space Description: \_\_\_\_\_ Date: \_\_\_\_\_  
 Purpose of Entry: \_\_\_\_\_ Time of Entry: \_\_\_\_\_  
 Entry Supervisor: \_\_\_\_\_ Time Expires: \_\_\_\_\_  
 Hazards and Controls \_\_\_\_\_ Check here if NO HAZARDS are Present: ☐

| Atmospheric Hazards (check if present)                     |  | Controls Required (check if required)  |  |
|--|--|--|--|
| Oxygen levels below 19.5%                                  |  | Initial testing (O <sub>2</sub> , LEL, CO, H <sub>2</sub> S)   |  |
| Oxygen levels above 23.5%                                  |  | Continuous monitoring (O <sub>2</sub> , LEL, CO, H <sub>2</sub> S)   |  |
| Flammable/combustible gases, vapors or dust (specify):     |  | Other testing* (specify type and duration):  |  |
| Toxic gases, vapors or dust (specify):                     |  | Ventilation – Blower w/ sufficient duct length   |  |
| Pressurized atmosphere                                     |  | Air purifying respirator (circle)  |  |
| Other (specify):   |  | Mask type: Half-face Full-face<br>Cartridge: P100 Combo P100/organic vapor<br>Other (specify):   |  |
| Configuration Hazard (specify):                            |  | Lines Broken-Capped or Blanked   |  |
| Engulfment Hazard (specify):                               |  | Purge-Flush and Vent   |  |
| Shock hazard/electrocution                                 |  | Lockout De-energize-Tested and Verified  |  |
| Slips, trips, falls (specify):                             |  | If Early Warning System is required, is it installed and operational:  |  |
| Moving parts (specify):                                    |  | Lighting (Explosion Proof)   |  |
| Connecting pipes, drains, ducts (specify):                 |  | Form of Communication (circle):<br>Voice Radio Other:  |  |
| Biological hazard (specify):                               |  | Visual Contact with Attendant  |  |
| Other (specify):   |  | Ground Fault Circuit Interrupter   |  |
| Person Protective Equipment (check if required)            |  | Rescue / Retrieval (check if required)   |  |
| Safety glasses / goggles (circle one)                      |  | Full body harness  |  |
| Hearing protection   |  | Retrieval tripod with winch  |  |
| Hard hat   |  | Lanyard and lifeline   |  |
| Steel-toed/steel shank shoes                               |  | Coordination with Responsible Person   |  |
|  |  | Coordination with local EMS and verify EMS is available the entire duration of the entry operation. If EMS become unavailable, require immediate notification and suspend entry operations until EMS becomes available |  |
| Disposable coveralls (Tyvek)                               |  | SCBA available for rescue  |  |
| Shoe covers  |  | Other (specify):   |  |
| Gloves (circle):<br>Disposable Chemical Protective Leather |  |  |  |
| Face shield  |  | Fire Extinguisher  |  |
| Other (specify):   |  |  |  |

### Atmospheric Testing

Test Interval (circle): Initial      Prior to Each Entry      Continuous

Tester's Name: \_\_\_\_\_

|                  | Time of Test              |              |        |        |        |        |        |        |
|------------------|---------------------------|--------------|--------|--------|--------|--------|--------|--------|
|                  | Initials of Tester        |              |        |        |        |        |        |        |
| Parameter        | Acceptable Entry Criteria | Initial Test | Test 2 | Test 3 | Test 4 | Test 5 | Test 6 | Test 7 |
| % Oxygen         | 19.5% to 23.5%            |              |        |        |        |        |        |        |
| % LEL*           | Less than 5%              |              |        |        |        |        |        |        |
| Carbon Monoxide  | Less than 25 ppm          |              |        |        |        |        |        |        |
| Hydrogen sulfide | Less than 10 ppm          |              |        |        |        |        |        |        |
|                  |                           |              |        |        |        |        |        |        |
|                  |                           |              |        |        |        |        |        |        |
|                  |                           |              |        |        |        |        |        |        |
|                  |                           |              |        |        |        |        |        |        |

List other gases or parameters to be tested in blank fields.

Was evacuation of space required at any time?      \_\_ YES      \_\_ NO

If so, why? \_\_\_\_\_

Time of evacuation: \_\_\_\_\_ Time of re-entry: \_\_\_\_\_

Controls or actions taken to correct reason for evacuation: \_\_\_\_\_

| Testing Instrument Used | Manufacturer | Serial No. | Date of Last Calibration |
|-------------------------|--------------|------------|--------------------------|
|                         |              |            |                          |
|                         |              |            |                          |

### Permit Authorization

I certify that I have reviewed the permit, understand the hazards that are or may be present, and have verified that the appropriate controls have been implemented. I understand the procedures necessary to ensure safe entry. No entry can be initiated until this permit is completed and signed by all Entrants, Attendants and the Entry Supervisor.

#### Authorized Entrants

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

#### Authorized Attendants

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

#### Entry Supervisor

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**PERMIT CLOSED AT:** Date: \_\_\_\_\_ Time: \_\_\_\_\_ By: \_\_\_\_\_

## Electrical Safety

The person(s) responsible for electrical safety on this project are;

---

**Electrical Contractor:** \_\_\_\_\_

The Hazardous Energy Control Policy must include all known and potential energy sources, including but not limited to;

- electrical
- pneumatic
- plumbing and steam

All electrical power is considered to be **energized** until the responsible electrician or appropriate **competent** person has **verified** and **tested** the system to make sure that it has been **de-energized**.

- The electrical safety program for this project shall include the effective management of the following;

### Electrical Cords

- **Must be protected from physical damage**
  - flexible cords must be free of damage, splices and taps
  - flexible cords shall be properly maintained and stored
  - twisted cords shall be removed from service and destroyed to prevent future use
  - free of splices
  - flexible cords should not be so placed that they are considered a trip and fall hazard
  - flexible cords shall have the appropriate grounding pins, or shall be double-insulate

### Lighting

- shall be adequate for the job site and per specifications.
- lighting shall be of the appropriate wattage, and placed in fixtures, including temporary in a manner specified by the lighting manufacturer
- emergency lighting is required if work on the project will extend to after daylight hours
- emergency lighting is required for below grade areas of the project and other areas where natural lighting is not available, in the event of a power failure

### Power Tools

- portable electrical equipment and tools must be grounded or double insulated
- the tools shall be free of damage, and if not removed from service

- Any power tool removed from service, because of damage, shall be labeled "Do Not Use."

### **Ground Fault Circuit Interrupters (GFCI)**

- GFCI protected equipment and tools can be accomplished by one of the following;
- a GFCI outlet
- an outlet protected by a GFCI breaker, or
- a portable GFCI pigtail
- GFCI protection for all power tools and flexible cords is required for the duration of the project.
- When permanent wiring for the building / project or site has been completed, GFCI protection shall still be required. All contractors on site shall either;
- obtain power from a permanently wired GFCI protected outlet, or
- utilize a GFCI adapter / pigtail between the power supply and the flexible cord or tool being used

### **Lock-Out / Tag-Out**

- As part of the Hazardous Energy Control Policy, "The Joint Venture" must have a written Lockout / Tag out program on site.
- The Lockout / Tag out program shall take all types of hazardous energy into consideration.
- For this project, the following systems will need to be part of the Lockout /

**Chemical**

**Electrical**

**HVAC**

**Plumbing**

**Pneumatic**

**Steam**

**Other(s)**

*Check off or otherwise identify all forms of energy that apply to the project*

- “The Joint Venture” can default to the electrical contractor’s lockout / tagout program.
- As part of the Hazardous Energy Control Policy, “The Joint Venture” must identify the Lockout / Tagout program that will be used on site. This program, typically the most stringent shall be used by all of the contractors working on site, and shall incorporate the owners Hazardous Energy Program, as the owner will most likely be part of a hazardous energy control / shutdown.
- For this project, “The Joint Venture” will use and train to the Hazardous Energy Control Policy of:

☐ **General Contractor**

☒ **Electrical Sub-Contractor**

**Owner**

☐ \_\_\_\_\_

*Check off the appropriate program to be used for this project*

## Trenching and Excavation

### GENERAL REQUIREMENTS

Protection of employees is required against cave-ins except when the excavation is in stable rock or less than five feet deep and where examination by a competent person provides no evidence that a cave-in should be expected; and against falling rock, soil or other material, by use of scaling to remove loose rock or soil

Material or equipment must be kept at least two feet from the edge of the trench

Daily inspection of excavations and adjacent areas by a competent person, and removal of exposed employees if evidence of possible cave-ins, failure of protective systems, hazardous atmospheres or other hazardous conditions, until necessary precautions have been taken

A competent person means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary or dangerous to employees and, and who has the authority to take immediate corrective action or measures to eliminate them

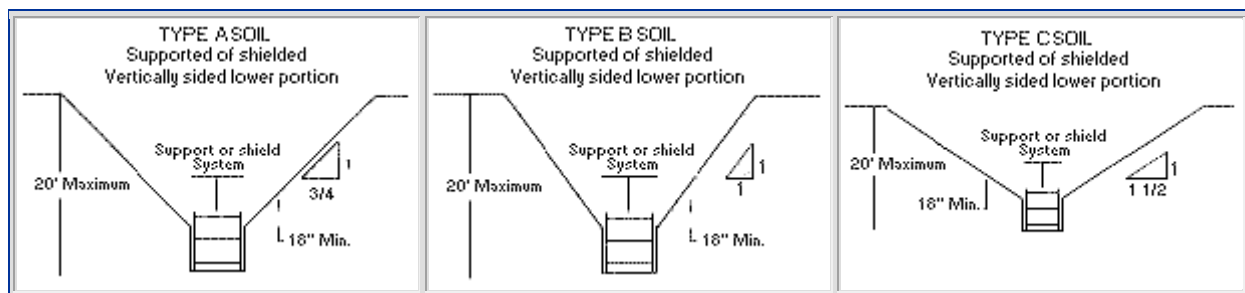
Ramps, runways, ladders or stairs as a means of access or egress must be within 25 feet of an employee work area if a trench is four feet deep or more

Support systems such as shoring, bracing, or underpinning to ensure the stability of adjacent structures such as buildings, walls or sidewalks

The standard allows an employer to use a trench box or shield that is either designed or approved by a registered professional engineer (R.P.E.) or is based on tabulated data by an R.P.E

The standard allows construction workers to remain inside trench shields that are being repositioned, provided that the shields are moved horizontally only and the shields are not stable and level on a flat surface.

**FIGURE V:2-12. SLOPE AND SHIELD CONFIGURATIONS.**



□ **SLOPING AND BENCHING**

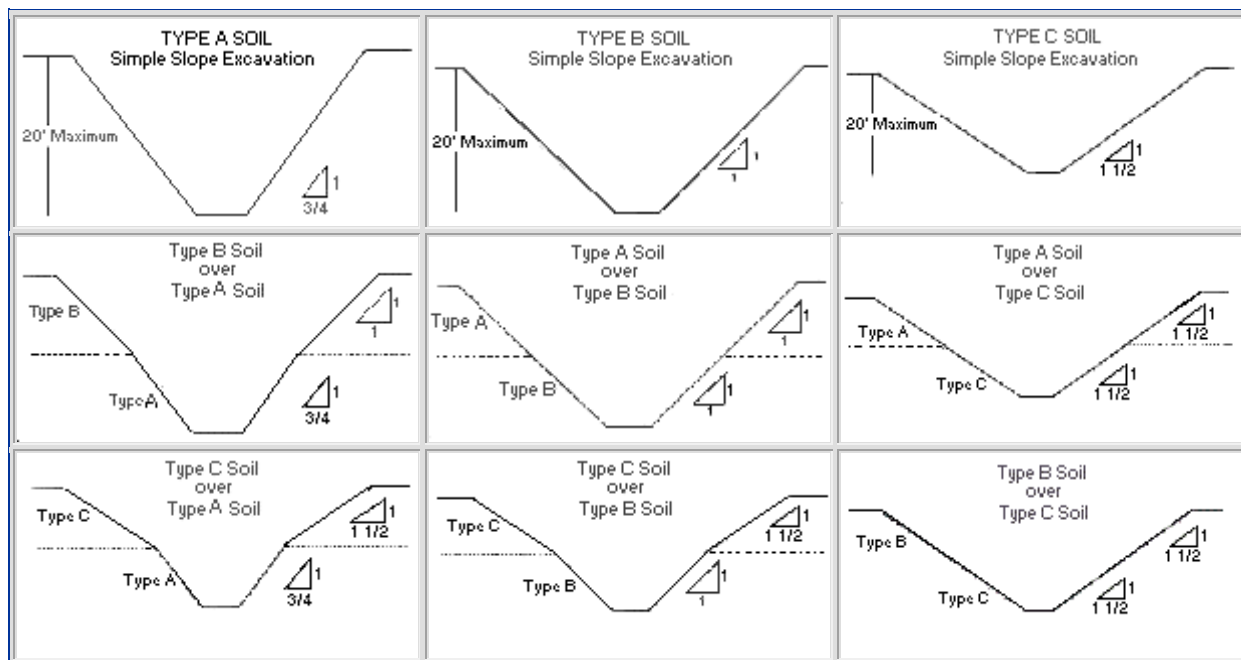
- A. **Sloping.** Maximum allowable slopes for excavations less than 20 ft (6.09 m) based on soil type and angle to the horizontal are as follows:

**TABLE V:2-1. ALLOWABLE SLOPES.**

| Soil type           | height/Depth ratio | Slope angle |
|---------------------|--------------------|-------------|
| Stable Rock         | Vertical           | 90°         |
| Type A              | $\frac{3}{4}:1$    | 53°         |
| Type B              | 1:1                | 45°         |
| Type C              | $1\frac{1}{2}:1$   | 34°         |
| Type A (short-term) | $\frac{1}{2}:1$    | 63°         |

(For a maximum excavation depth of 12 ft)

**FIGURE V:2-13. SLOPE CONFIGURATIONS: EXCAVATIONS IN LAYERED SOILS.**



**SPECIAL HEALTH AND SAFETY CONSIDERATIONS**

- A. **Competent Person.** The designated competent person should have and be able to demonstrate the following:



- Training, experience, and knowledge of:
  - soil analysis;
  - use of protective systems; and
  - requirements of 29 CFR Part 1926 Subpart P.
- Ability to detect:
  - conditions that could result in cave-ins;
  - failures in protective systems;
  - hazardous atmospheres; and
  - other hazards including those associated with confined spaces.
- Authority to take prompt corrective measures to eliminate existing and predictable hazards and to stop work when required.

**B. Surface Crossing of Trenches.** Surface crossing of trenches should be discouraged; however, if trenches must be crossed, such crossings are permitted only under the following conditions:

- Vehicle crossings must be designed by and installed under the supervision of a registered professional engineer.
- Walkways or bridges must be provided for foot traffic. These structures shall:
  - have a safety factor of 4;
  - have a minimum clear width of 20 in (0.51 m);
  - be fitted with standard rails; and
  - extend a minimum of 24 in (.61 m) past the surface edge of the trench.

**C. Ingress and Egress.** Access to and exit from the trench require the following conditions:

- Trenches 4 ft or more in depth should be provided with a fixed means of egress.
- Spacing between ladders or other means of egress must be such that a worker will not have to travel more than 25 ft laterally to the nearest means of egress.
- Ladders must be secured and extend a minimum of 36 in (0.9 m) above the landing.
- Metal ladders should be used with caution, particularly when electric utilities are present.

**D. Exposure to Vehicles.** Procedures to protect employees from being injured or killed by vehicle traffic include:

- Providing employees with and requiring them to wear warning vests or other suitable garments marked with or made of reflectorized or high-visibility materials.
- Requiring a designated, trained flagperson along with signs, signals, and barricades when necessary.

**E. Exposure to Falling Loads.** Employees must be protected from loads or objects falling from lifting or digging equipment. Procedures designed to ensure their protection include:

- Employees are not permitted to work under raised loads.
- Employees are required to stand away from equipment that is being loaded or unloaded.
- Equipment operators or truck drivers may stay in their equipment during loading and unloading if the equipment is properly equipped with a cab shield or adequate canopy.

**F. Warning Systems for Mobile Equipment.** The following steps should be taken to prevent vehicles from accidentally falling into the trench:

- Barricades must be installed where necessary.
- Hand or mechanical signals must be used as required.
- Stop logs must be installed if there is a danger of vehicles falling into the trench.
- Soil should be graded away from the excavation; this will assist in vehicle control and channeling of run-off water.

**G. Hazardous Atmospheres and Confined Spaces.** Employees shall not be permitted to work in hazardous and/or toxic atmospheres. Such atmospheres include those with:

- Less than 19.5% or more than 23.5% oxygen;
- A combustible gas concentration greater than 20% of the lower flammable limit; and
- Concentrations of hazardous substances that exceed those specified in the *Threshold Limit Values for Airborne Contaminants* established by the ACGIH (American Conference of Governmental Industrial Hygienists).

All operations involving such atmospheres must be conducted in accordance with OSHA requirements for occupational health and environmental controls (see Subpart D of 29 CFR 1926) for personal protective equipment and for lifesaving equipment (see Subpart E of 29 CFR 1926). Engineering controls (e.g., ventilation) and respiratory protection may be required.

When testing for atmospheric contaminants, the following should be considered:

- Testing should be conducted before employees enter the trench and should be done regularly to ensure that the trench remains safe.
- The frequency of testing should be increased if equipment is operating in the trench.
- Testing frequency should also be increased if welding, cutting, or burning is done in the trench.

Employees required to wear respiratory protection must be trained, fit-tested, and enrolled in a respiratory protection program. Some trenches qualify as confined spaces. When this occurs, compliance with the Confined Space Standard is also required.

H. **Emergency Rescue Equipment.** Emergency rescue equipment is required when a hazardous atmosphere exists or can reasonably be expected to exist. Requirements are as follows:

- Respirators must be of the type suitable for the exposure. Employees must be trained in their use and a respirator program must be instituted.
- Attended (at all times) lifelines must be provided when employees enter bell-bottom pier holes, deep confined spaces, or other similar hazards.
- Employees who enter confined spaces must be trained.

I. **Standing Water and Water Accumulation.** Methods for controlling standing water and water accumulation must be provided and should consist of the following if employees are permitted to work in the excavation:

- Use of special support or shield systems approved by a registered professional engineer.
- Water removal equipment, i.e. well pointing, used and monitored by a competent person.
- Safety harnesses and lifelines used in conformance with 29 CFR 1926.104.
- Surface water diverted away from the trench.
- Employees removed from the trench during rainstorms.
- Trenches carefully inspected by a competent person after each rain and before employees are permitted to re-enter the trench.

J. **Inspections.** Inspections shall be made by a competent person and should be documented. The following guide specifies the frequency and conditions requiring inspections:

- Daily and before the start of each shift;
- As dictated by the work being done in the trench;
- After every rainstorm;
- After other events that could increase hazards, e.g. snowstorm, windstorm, thaw, earthquake, etc.;
- When fissures, tension cracks, sloughing, undercutting, water seepage, bulging at the bottom, or other similar conditions occur;
- When there is a change in the size, location, or placement of the spoil pile; and
- When there is any indication of change or movement in adjacent structures.

|   |                 |                              |                    |   |  |
|---|-----------------|------------------------------|--------------------|---|--|
| <b>LOCATION:</b>  |                 |                              |                    | <b>DATE:</b>  |  |
| <b>TIME OF INSPECTION(S)</b>  |                 |                              |                    |   |  |
| <b>WEATHER CONDITIONS:</b>  |                 |                              |                    | <b>APPROX. TEMP.:</b>   |  |
| <b>CREW LEADER:</b>   |                 |                              | <b>SUPERVISOR:</b> |   |  |
|   | <b>DEPTH =</b>  |                              |                    |   |  |
|   | <b>TOP =</b>    | W                            | L                  | <input type="checkbox"/> <input type="checkbox"/> .....Saturated soil / standing or seeping water |  |
|   | <b>BOTTOM =</b> | W                            | L                  | <input type="checkbox"/> <input type="checkbox"/> .....Cracked or fissured wall(s)                |  |
|   |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> .....Bulging wall(s)                            |  |
| <input type="checkbox"/> Solid rock (most stable)                                       |                 | <input type="checkbox"/> Yes |                    | <input type="checkbox"/> <input type="checkbox"/> .....Floor heaving                              |  |
| <input type="checkbox"/> Average soil   |                 | <input type="checkbox"/> No  |                    | <input type="checkbox"/> <input type="checkbox"/> .....Frozen soil                                |  |
| <input type="checkbox"/> Fill material  |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> .....Super-imposed loads                        |  |
| <input type="checkbox"/> Loose sand   |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> .....Vibration                                  |  |
|   |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> .....Depth greater than 10'                     |  |
| <b>(Walls MUST be vertical—NO voids)</b>  |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> .....Spoils at least 2 feet from edge of trench |  |
|   |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> .....Equipment at least 2 feet from edge        |  |
| <input type="checkbox"/> Timber   |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> .....Backhoe at end of trench                   |  |
| <input type="checkbox"/> Pneumatic  |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> .....Compressor, etc. at remote location        |  |
| <input type="checkbox"/> Hydraulic  |                 |                              |                    |   |  |
| <input type="checkbox"/> Screw Jacks  |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> .....Located in protected area                  |  |
| <input type="checkbox"/> Trench Shield  |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> .....Within 25 feet of safe travel              |  |
|   |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> .....Secured                                    |  |
| <input type="checkbox"/> Trench Box   |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> .....Extends 36 inches above the landing        |  |
| <b>Sloping:</b> <input type="checkbox"/> 1:1 (45°) <input type="checkbox"/> 1 ½:1 (34°) |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> .....Leads to safe landing                      |  |
| <input type="checkbox"/> <input type="checkbox"/> Gas detector used?                    |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> Shoring equip. & matls inspected prior to use?  |  |
| <input type="checkbox"/> <input type="checkbox"/> Confined space permit issued?         |                 |                              |                    | <input type="checkbox"/> <input type="checkbox"/> Is trench SAFE to enter?                        |  |
| <b>COMMENTS:</b>  |                 |                              |                    |   |  |
|   |                 |                              |                    |   |  |
|   |                 |                              |                    |   |  |
|   |                 |                              |                    |   |  |

## **Scaffold Safety Highlights**

1. Only qualified persons should design, build or inspect scaffolds. Each application must be planned to ensure that the scaffolding conforms to all specified assembly requirements.
2. Lean to scaffolds and makeshift platforms are prohibited.
3. Only materials currently being used should be stored on scaffolds. Materials are to be placed over cross members at all times. All materials should be removed from the scaffold nightly.
4. All scaffolds should be designed to carry four times the maximum intended load. At no time, should the scaffold be overloaded. Unstable objects such as barrels, boxes, and loose bricks should not be used to support scaffolds.
5. All scaffolds over ten feet high are required to have load footprints and limits that can be obtained from the scaffold manufacturer. A copy of all load footprints and limits should be given to any supplier stocking material on the scaffold.
6. All scaffolds must be maintained in safe condition and scaffolds damaged or weakened must be replaced immediately.
7. Scaffolds more than ten feet above the ground must have standard guardrails and toe boards attached.
8. Scaffolds should be braced and tied horizontally and vertically at intervals according to specified regulations.
9. Scaffolds with any dimension less than 45 inches should be equipped with outriggers or secured and guarded with standard four feet high railings.
10. Mobile scaffolds should be equipped with guardrails, midrails, toe boards, and outriggers.
11. All casters should be locked. Mobile scaffolds should not be used if there is a change in the floor level elevation.
12. Scaffold tags should be completed and attached to each scaffold prior to it being used.
13. Safe access must be available to each working level at all times. Workers should never climb a scaffold's cross bracing. Both hands should be free of tools/materials when ascending or descending a scaffold. Employees should not propel themselves while working on scaffolds.
14. At the start of each shift, a competent person should inspect each scaffold for requirements of the standard and as needed.
15. Adjusting or leveling screw jacks must not be extended more than 12 inches of thread.
16. Swinging stages boatswain chains, floats and needle beams require special approval by a safety representative before use plus require independent life lines and required training.
- 17. All persons occupying scaffold must have scaffold user training.**
18. All scaffold components must be inspected prior to installation

## Fall Protection

In accordance with the requirements of OSHA 29 CFR 1926.500, **all employers are required to provide fall protection equipment and training to their employees when working at elevations is 6' or more, above a lower level**, which includes but is not limited to the ground, platforms, roof or dangerous equipment. Each subcontractor on this project is responsible for their employees, as well as to be sure the sub-contractor has a written fall protection program and a competent person, and shall have a "competent person" on-site at all times.

For this project, the following work activities and fall protection height requirements are;

|                                |    |
|--------------------------------|----|
| <b>General Fall Protection</b> | 6' |
| <b>Excavations</b>             | 6' |
| <b>Scaffolding / Staging</b>   | 6' |
| <b>Roof Work</b>               | 6' |

For work on the roof, the contractor will utilize the following safety practices;

|   |                                  |   |                   |   |                      |   |
|---|----------------------------------|---|-------------------|---|----------------------|---|
| — | <b>Fall Protection Equipment</b> | — | <b>Guardrails</b> | — | <b>Warning Lines</b> | — |
|---|----------------------------------|---|-------------------|---|----------------------|---|

Guardrails shall be at least 42" in height (+/- 3") with mid rails and toe boards in place. If materials are placed on the elevated surfaces, higher than the level of the toe board, a protective measure shall be attached to the elevated surface (guardrail system) to prevent the storage from being displaced, over the edge of the toe boards. If the protective measure used is netting/screening or similar attached to the guardrail system is used on the exterior scaffold / staging, its use must be approved of by a "competent person" for the scaffolding / staging company and the local fire department for fire rating.

All wall openings, including windows with elevation differences >6' shall be properly protected with suitable guardrails or other recognized fall protection systems. When holes or openings are used for the passage of materials, such as through a window or elevated level of scaffolding/staging, the opening must be guarded on at least 3 sides when being used for the transfer of materials, and the 4th side, when not being used should be protected with a suitable (removable) guardrail or gate as specified by the competent person.

Guardrails are required around points of access, such as a ladder-way. The open side of the opening shall have a gate, or be off-set to prevent person(s) from falling through or into the opening. When the use of ladders or stilts are required that places the user above the level of fall protection, the competent person shall select an appropriate means of fall protection to cover the increase in height.

Options include the use of harness and lifelines, extending the guardrail system up, or placing the workers in a guardrail system in an elevated platform. When using warning lines for fall protection, in place of guardrail systems, the warning lines must be;

- Rigged and supported to a height of 39' Rigged and supported to a height of 39 – 45"
- the lowest point is 34' the lowest point is 34" – 39"
- be flagged every 6'

Fall Protection Equipment including, but not limited to harnesses, lanyards, deceleration devices, anchors, straps and other fall protection equipment shall be:

Inspected by a competent person before each use for damage and deficiencies

- Any fall protection equipment that has been damaged, must be removed from service and labeled out-of-service.
- Kept clean and placed in suitable containers to prevent exposure to abuse, damage and adverse environmental conditions.
- Holes  $\geq 2$ " (inches) in diameter in a walk or work area must be covered or otherwise protected to prevent items, materials and tools from falling through.
- The hole cover must be labeled "HOLE" or "COVER"
- All ramps, stairs and walkways, including those that are temporary are required to have hand / guard rails on both sides if there are  $\geq 3$  steps, or a drop of  $\geq 6'$ .

### Roof Work

- All roof work which is greater than 6' above a lower level is required to have fall protection, including flat and low-slope roofs.
- A competent person must identify the appropriate means of fall protection to be used, for the work being performed.

For this project, the roof slopes are:

### No Slope (Flat)

☐  $< 4:12$     ☐  $> 4:12, < 6:12$     ☐  $> 6:12, < 8:12$     ☐  $\geq 8:12$

the use of the following types of fall protection will be required:

**Controlled Access Zones**

**Guardrails**

**Monitor(s)**

☐ **Scaffold/Staging**

**Warning Lines**

☐ **Other:**

**For this project the use of a roof monitor**

is  
permitted

is not  
permitted



If a roof monitor is used as fall protection, the roof must be flat (no pitch) and less than 50' in length and width, the monitor is not permitted to perform any work, shall wear a reflective vest or blue hard hat and shall not permit any equipment to be running during the roof work.

**Warning lines, if used on the roof for fall protection must:**

- be placed at least 6' back from the roofs edge,
- be flagged every 6' in contrasting color,
- not be permitted (at any point) to be lower than 34" above the roof, and
- be able to withstand a force of 16 lbs. applied at the stanchions

No person, unless actually performing work between the warning line and the roofs edge is permitted outside of the warning line.



## **FIRE PREVENTION**

Whenever the fire detection system must be altered, shut-down or removed from service, the local fire department shall be notified in advance.

- “The Joint Venture” shall also notify the owner and verify notification of the owner's insurance company.

In the event of a fire alarm, all persons within the building are required to evacuate as referenced in the Emergency Action Program section referenced at the beginning of the site specific environmental health and safety program.

### **Fire Extinguishers**

Extinguishers shall be conspicuously placed in appropriate areas of the construction or project site. As a minimum, a suitable (code compliant) extinguisher must be placed at;

- each EXIT door on all floors
- within 25' of all hot work activities and operations, as well as on each welding cart
- no greater than 100 feet between units

Fire Extinguishers on site shall have the following;

- annual (in date) inspection tag
- a gauge indicating fully charged, and
- pin with security seal

**Fire extinguishers shall only be used by personnel who have been trained to use this equipment**

**Persons without training shall evacuate the building**

**In the event of a fire emergency, regardless of size, the following shall occur;**

- Notify person(s) within the immediate vicinity of the fire, and request that they evacuate.
- Leave the area or room, and if possible close the door to the room
- Activate the closest fire alarm pull station, which is typically located next to the stairs or exit door.
- From a safe location, such as outside by cell phone, dial the local emergency number or 911 and report the emergency.
- If the above requirements have been completed, you are trained, and you are comfortable with the size of the fire and the use of the extinguisher, then attempt to extinguish the fire, but do not place yourself at risk.
- Report all fires, and complete the appropriate incident reports. Return any damaged, defective, discharged or outdated extinguisher to the project superintendent for replacement.

## **Fire Suppression**

The fire suppression systems (sprinkler, standpipe or other specialized system) shall be installed and maintained in accordance with the requirements of the Massachusetts State Building Code, 780 CMR 9.

- For alterations and renovations, existing sprinklers and/or standpipes must remain in place and operational until it is absolutely necessary to remove parts thereof.
- Whenever the fire suppression system must be altered, shut-down or removed from service, the local fire department shall be notified in advance.

## **HEATING EQUIPMENT**

- Heating equipment used on site shall meet the requirements of OSHA 29 CFR 1926.53; 1926.154 and the local and state fire prevention regulations.
  - Permits are required for the use of salamanders and other heating equipment that utilize natural gas and/or propane.
    - Propane gas tanks and cylinders require;
      - permits for the storage and use of gas
      - a suitable base
      - gas cylinders require a chain or strap to secure
  - No flammable or combustible gases or liquids, or open flames can be located near any means of egress on a construction site. If heaters are located in close proximity to a door, the fuel supplying same shall be a minimum of 25' from the door.
  - When heating devices are utilized on site, which require combustible fuels, including coal, fuels, gases and wood, an approved carbon monoxide detector shall be used to verify that levels are carbon monoxide do not exceed 30ppm.
  - L.P.G. Cylinders must be protected by contact with motorized vehicles.
  - Non-vented open flame heaters will not be used.
  - No propane-type heating units will be used in an enclosed building.

## **Concrete and Masonry**

### **SCOPE AND APPLICATION**

The standard, Subpart Q, prescribes performance-oriented requirements designed to help protect all construction workers from the hazards associated with concrete and masonry construction operations at construction, demolition, alteration or repair worksites. Other relevant provisions in both general industry and construction standards (29 CFR Part 1910 and 1926) also apply to these operations.

### **GENERAL REQUIREMENTS**

Cleaning of masonry: No cleaning agents that contain acid shall be used.

#### **Construction Loads**

Employers must not place construction loads on a concrete structure or portion of a concrete structure unless the employer determines, based on information received from a person who is qualified in structural design, that the structure or portion of the structure is capable of supporting the intended loads.

#### **Reinforcing Steel**

All protruding reinforcing steel, onto and into which employees could fall, must be guarded to eliminate the hazard of impalement.

#### **Concrete Buckets**

Employees must not be permitted to ride concrete buckets.

#### **Working Under Loads**

Employees must not be permitted to work under concrete buckets while the buckets are being elevated or lowered into position.

To the extent practicable, elevated concrete buckets must be routed so that no employee or the fewest employees possible are exposed to the hazards associated with falling concrete buckets.

#### **Personal Protective Equipment**

Employees must not be permitted to apply a cement, sand, and water mixture through a pneumatic hose unless they are wearing protective head and face equipment.

Employees must not be permitted to place or tie reinforcing steel more than 6 feet above any adjacent working surfaces unless they are protected by the use of a safety belt or equivalent fall protection meeting the criteria in OSHA standards on Personal Protective and Life Saving Equipment (29 CFR 1926 Subpart E).

## **Equipment and Tools**

The standard also includes requirements for the following equipment and operations:

- Bulk cement storage,
- Concrete mixers,
- Power concrete trowels,
- Concrete buggies,
- Concrete pumping systems,
- Concrete buckets,
- Tremies,
- Bull floats,
- Masonry saws, and
- Lockout/tagout procedures.

## CAST-IN-PLACE CONCRETE

### General Requirements for Formwork

Formwork must be designed, fabricated, erected, supported, braced, and maintained so that it will be capable of supporting without failure all vertical and lateral loads that might be applied to the formwork. As indicated in the Appendix to the standard, formwork that is designed, fabricated, erected, supported, braced and maintained in conformance with Sections 6 and 7 of the *American National Standard for Construction and Demolition Operations - Concrete and Masonry Work* (ANSI A10.9-1983) also meets the requirements of this paragraph.

### Drawings or Plans

Drawings and plans, including all revisions for the jack layout, formwork (including shoring equipment), working decks and scaffolds, must be available at the jobsite.

### Shoring and Reshoring

All shoring equipment (including equipment used in reshoring operations) must be inspected prior to erection to determine that the equipment meets the requirements specified in the formwork drawings.

Damaged shoring equipment must not be used for shoring. Erected shoring equipment must be inspected immediately prior to, during, and immediately after concrete placement. Shoring equipment that is found to be damaged or weakened after erection must be immediately reinforced.

- Designed by a qualified designer and the erected shoring must be inspected by an engineer qualified in structural design,
- Vertically aligned,
- Spliced to prevent misalignment, and
- Adequately braced in two mutually perpendicular directions at the splice level. Each tier also must be diagonally braced in the same two directions.

Adjustment of single-post shores to raise formwork must not be made after the placement of concrete.

Reshoring must be erected, as the original forms and shores are removed, whenever the concrete is required to support loads in excess of its capacity.

### Reinforcing Steel

Reinforcing steel for walls, piers, columns, and similar vertical structures must be adequately supported to prevent overturning and collapse.

Employers must take measures to prevent unrolled wire mesh from recoiling. Such measures may include, but are not limited to, securing each end of the roll or turning over the roll.

### Removal of Formwork

- The plans and specifications stipulate conditions for removal of forms and shores, and such conditions have been followed, or
- The concrete has been properly tested with an appropriate American Society for Testing and Materials (ASTM) standard test method designed to indicate the concrete compressive strength, and the test results indicate that the concrete has gained sufficient strength to support its weight and superimposed loads.

Reshoring must not be removed until the concrete being supported has attained adequate strength to support its weight and all loads in place upon it.

### **Limited Access Zone is Required;**

- Equal to the height of the wall to be constructed plus 4 feet, and shall run the entire length of the wall;
- Restricted to entry only by employees actively engaged in constructing the wall; and
- Kept in place until the wall is adequately supported to prevent overturning and collapse unless the height of wall is more than 8 feet and unsupported; in which case, it must be braced. The bracing must remain in place until permanent supporting elements of the structure are in place.
- Workers not allowed under concrete buckets when being elevated or lowered.
- Workers must wear protective head, face, and eye equipment when placing concrete with a pneumatic hose.
- Manually guided concrete troweling machine must be equipped with automatic controls to shut off power when hands are removed.
- Compressed air hoses must be provided with positive fail-safe joint connectors.
- Concrete buckets must have positive safety features or similar devices to prevent accidental dumping.
- Tremie Sections must be secured with wire rope ( or equivalent materials) in addition to regular couplings or connections.
- Drawing or plans for the jack layout, framework, working decks, and scaffolds must be available on site.
- Shoring and Reshoring
  - Inspected prior to erection
  - Damaged equipment shall not be used
  - Inspected immediately prior to swing and immediately after concrete placement
  - Damaged equipment immediately removed from service
- No adjustments to single post shores to raise formwork made after placement of concrete
- Reshoring must be erected as original forms are removed

## **Precast Concrete**

### **SUMMARY**

OSHA's standard includes the following:

- Expands and toughens protection against masonry wall collapses by requiring bracing and a limited access zone prior to the construction of a wall;
- Permits employers to use several more recently developed methods of testing concrete instead of just the one currently recognized method; and
- Sets and clarifies requirements for both cast-in-place concrete and precast concrete during construction.

Compliance with the common-sense requirements of the OSHA standard discussed here should greatly reduce or eliminate the injuries and accidents that occur too frequently during concrete and masonry construction.

### **HOUSEKEEPING**

- Contractors are responsible for the overall housekeeping practices on the site.
- In the event contractors do not comply, the service will be subcontracted to others and the responsible contractor/ subcontractor may be back-charged.
- As a minimum, the aisles, exits and other parts of the means of egress shall be properly maintained and free of unnecessary storage and waste.
- Sawdust and other combustible materials such as cardboard and paper shall be removed daily to reduce the risk of injury and fire.
- Trip and fall hazards shall be removed as soon as possible, especially in areas considered to be walk / work surfaces
- Dumpsters  $\geq 6$  cubic yards in size, located on a construction site require a permit from the fire department.
  - The dumpster shall not be placed up against the building under construction, unless approved by the local fire department.
  - The dumpster, in accordance with the requirements of the building code shall be immediately emptied, when full.

Housekeeping practices on this project is extremely important. In order to reduce the risk of fire, prevent injuries and reduce the risk of a regulatory inspection, housekeeping must be maintained.

- Waste shall be discarded in a suitable container.
- Sawdust and rags should be placed in a metal (approved) container with tight (proper-fitting) lid.
- All waste containers (inside the building) shall be emptied at least daily.
- Corridors and other walk / work areas shall not be used for storage.

**Flammable / Combustible Liquids**

- Shall be placed in appropriate containers and cabinets.
- The cabinets and containers shall be NFPA compliant, as required by the local building and fire departments.
- Shall not be located in a means of egress or exit.
- Shall be labeled properly (without abbreviation). The name of the chemical and the appropriate hazard must appear on the “appropriate” container.



## Steel Erection (Subpart R)

### Requirements

In accordance with the requirements of OSHA, all employers are required to provide **fall protection**, equipment and training to their employees when working at elevations above a lower level, which includes but is not limited to the ground, platforms, structural steel members, roofs or dangerous equipment. Steel erectors on this project are responsible for their steel erection. Contractor and any subcontractor must have a written fall protection program and a competent person. A "competent person" must be on-site at all times.

### FALL PROTECTION REVIEW

Permanent floors shall be installed as soon as practical following the erection of structural members. At no time shall there be more than four floors or 48 feet of unfinished bolting or welding above the foundation or uppermost secured floor.

#### Temporary Flooring

The erection floor shall be solidly planked or decked over its entire surface except for access openings. Planking shall be not less than 2 inches thick, full size, undressed, and shall be laid tight and secured against movement.

#### Perimeter Protection

A safety railing of one-half inch diameter wire rope shall be installed and maintained approximately 42 inches (+/- 3"), around the periphery of all decked floors following the completion of structural steel erection on that floor. The distance between uprights should typically not exceed 8 feet. Wire rope must not deflect more than 3 inches under a downward force of 200 pounds. Wire rope clamps must be installed per the chart contained in Subpart R

#### Erection Plan

An erection plan consisting of the following items will be prepared and reviewed with the Project Manager prior to start of work.

#### General Requirements:

A qualified person shall approve all changes in the safety erection plan.  
A copy of the erection plan with all approved changes shall be maintained at the jobsite.  
The implementation of the erection plan shall be under the supervision of a competent person.

## **FALL PROTECTION**

Each employee engaged in a steel erection activity that is on a walking/working surface with an unprotected side or **edge 6 feet or greater above a lower level shall be protected from fall hazards by guardrail systems, safety net systems, personal fall arrest systems, positioning device systems or fall restraint systems.**

Bundles of sheets or small material shall be so secured as to prevent them from falling.

When setting structural steel, each piece shall be secured with not less than two bolts at each connection and drawn up wrench tight before the load is released.

Material shall not be hoisted to a structure unless it is ready to be put into place and secured.

When loads are being hoisted, all personnel are to be prevented from walking under the lift. No one shall be permitted to ride the load for any reason under any circumstances whatsoever.

A tag line shall be used to control loads.

For the protection of other crafts on the project, signs shall be posted in the erection area marked, "DANGER - MEN WORKING OVERHEAD."

"Christmas Tree" rigging, or the lifting of more than one member at one time shall conform to the requirements of Subpart R.

## Components of an Erection Plan

| Task   | Complete | Date |
|--|----------|------|
| The sequence of erection activity, developed in coordination with the controlling contractor, that includes the following: |          |      |
| Material deliveries (Schedule)   |          |      |
| Material staging and storage areas   |          |      |
| Coordination with other trades and construction activities.  |          |      |
| A description of the crane and derrick selection and placement procedures, including the following:                        |          |      |
| Site preparation;  |          |      |
| Path for overhead loads  |          |      |
| Critical lifts, including rigging supplies and equipment.  |          |      |
| A description of steel erection activities and procedures, including the following:  |          |      |
| Stability considerations requiring temporary bracing and guying;   |          |      |
| Erection bridging terminus point;  |          |      |
| Anchor rod (anchor bolt) notifications regarding repair, replacement and modifications;                                    |          |      |
| Columns and beams (including joists and purlins);  |          |      |
| Connections (ie: Double connections)   |          |      |
| Decking: Fall arrest, CDZ  |          |      |
| Ornamental and miscellaneous iron (Fall Arrest Method)   |          |      |
| A description of the fall protection procedures that will be used to comply with project requirements                      |          |      |
| A description of the procedures that will be used to comply with Falling object protection                                 |          |      |
| A description of the special procedures required for hazardous non-routine tasks.  |          |      |
| Training for performing steel erection operations as required  |          |      |
| A list of the qualified and competent persons.   |          |      |
| A description of the procedures that will be utilized in the event of rescue or emergency response.                        |          |      |
| (d) Other plan information. The plan:  |          |      |
| Includes the identification of the site and project; and   |          |      |
| Is signed and dated by the qualified person(s) responsible for its preparation and modification.                           |          |      |

## Subpart R

### What activities are covered?

#### Scope

1926.750

(a) This subpart sets forth requirements to protect employees from the hazards associated with steel erection activities involved in the construction, alteration, and/or repair of single and multi-story buildings, bridges, and other structures where steel erection occurs. The requirements of this subpart apply to employers engaged in steel erection unless otherwise specified. This subpart does not cover electrical transmission towers, communication and broadcast towers, or tanks.

Note to paragraph (a): Examples of structures where steel erection may occur include but are not limited to the following: Single and multi-story buildings; systems-engineered metal buildings; lift slab/tilt-up structures; energy exploration structures; energy production, transfer and storage structures and facilities; auditoriums; malls; amphitheaters; stadiums; power plants; mills; chemical process structures; bridges; trestles; overpasses; underpasses; viaducts; aqueducts; aerospace facilities and structures; radar and communication structures; light towers; signage; billboards; scoreboards; conveyor systems; conveyor supports and related framing; stairways; stair towers; fire escapes; draft curtains; fire containment structures; monorails; aerial ways; catwalks; curtain walls; window walls; store fronts; elevator fronts; entrances; skylights; metal roofs; industrial structures; hi-bay structures; rail, marine and other transportation structures; sound barriers; water process and water containment structures; air and cable supported structures; space frames; geodesic domes; canopies; racks and rack support structures and frames; platforms; walkways; balconies; atriums; penthouses; car dumpers; stackers/ reclaimers; cranes and craneways; bins; hoppers; ovens; furnaces; stacks; amusement park structures and rides; and artistic and monumental structures.

**(b)(1) Steel erection activities include hoisting, laying out, placing, connecting, welding, burning, guying, bracing, bolting, plumbing and rigging structural steel, steel joists and metal buildings; installing metal decking, curtain walls, window walls, siding systems, miscellaneous metals, ornamental iron and similar materials; and moving point-to-point while performing these activities.**

**(2) The following activities are covered by this subpart when they occur during and are a part of steel erection activities: rigging, hoisting, laying out, placing, connecting, guying, bracing, dismantling, burning, welding, bolting, grinding, sealing, caulking, and all related activities for construction, alteration and/or repair of materials and assemblies such as structural steel; ferrous metals and alloys; non-ferrous metals and alloys; glass; plastics and synthetic composite materials; structural metal framing and related bracing and assemblies; anchoring devices; structural cabling; cable stays; permanent and temporary bents and towers; false work for temporary supports of permanent steel members; stone and other non- precast concrete architectural materials mounted on steel frames; safety systems for steel erection; steel and metal joists; metal decking and raceway systems and accessories; metal roofing and accessories; metal siding; bridge flooring; cold formed steel framing; elevator beams; grillage; shelf racks; multi-purpose supports; crane rails and accessories; miscellaneous, architectural and ornamental metals and metal work; ladders; railings;**

**handrails; fences and gates; gratings; trench covers; floor plates; castings; sheet metal fabrications; metal panels and panel wall systems; louvers; column covers; enclosures and pockets; stairs; perforated metals; ornamental iron work, expansion control including bridge expansion joint assemblies; slide bearings; hydraulic structures; fascia's; soffit panels; penthouse enclosures; skylights; joint fillers; gaskets; sealants and seals; doors; windows; hardware; detention/security equipment and doors, windows and hardware; conveying systems; building specialties; building equipment; machinery and plant equipment, furnishings and special construction.**

For this project, the following work activities and fall protection height requirements are;

|                                |        |
|--------------------------------|--------|
| <b>General Fall Protection</b> | 6 Feet |
|--------------------------------|--------|

|                                     |        |
|-------------------------------------|--------|
| <b>Connectors / Deck Installers</b> | 6 Feet |
|-------------------------------------|--------|

Guardrails shall be at least 42" in height (+/- 3") with mid rails and toe boards in place. If materials are placed on the elevated surfaces, higher than the level of the toe board, a protective measure shall be attached to the elevated surface (guardrail system) to prevent the storage from being displaced, over the edge of the toe boards

All wall openings, including windows with elevation differences >6' shall be properly protected with suitable guardrails or other recognized fall protection systems. When holes or openings are used for the passage of materials, such as through a window or elevated level of scaffolding/staging, the opening must be guarded on at least 3 sides when being used for the transfer of materials, and the 4th side, when not being used should be protected with a suitable (removable) guardrail or gate as specified by the competent person.

Guardrails are required around points of access, such as a ladder-way. The open side of the opening shall have a gate, or be off-set to prevent person(s) from falling through or into the opening. When the use of ladders or stilts are required that places the user above the level of fall protection, the competent person shall select an appropriate means of fall protection to cover the increase in height.

## **Welding / Hot-Work**

Brazing, cutting, heating, soldering, welding and other spark producing work on this job requires the acquisition of a Hot Work Permit, as required by the local fire department and OSHA.

### **Hot Work Permit**

- The basic requirements of a Hot Work Permit are;
  - The area(s) in which the Hot Work will be performed must be inspected
  - All containers, pipes and tanks that were used for other than water or steam shall first be purged and cleaned
  - All combustible material shall be located at least 35' away from the Hot Work Area
  - Fire extinguishers must be of proper size and type for the Hot Work activity, and shall be located within 25' of the Hot Work Area
    - Exhaust ventilation or other smoke evacuation / neutralization system shall be used at the area of Hot Work to reduce employee exposure.

**A fire watch must be maintained for at least 1 hour after hot work has ended when inside of a structure or building.**

**Permits may be obtained.....**

## HOT WORK PERMIT

Company Name:

Date:

Work Location:

Type of Work:

Start Time:

Finish Time:

### CHECKLIST FOR HOT WORK

|  | Yes | No |
|--|-----|----|
| Person doing hot work has been trained in safe operation of equipment  |     |    |
| Appropriate PPE (eye protection, helmet, protective clothing, respirator, gloves, etc.) available                              |     |    |
| Welding flash screens will be used   |     |    |
| Charged, Inspected Fire extinguishers placed for immediate use   |     |    |
| Floors swept clean of combustible materials  |     |    |
| Combustible floors protected with fire-resistant shields   |     |    |
| Combustible materials and supplies moved away from hot work location or adequately covered.                                    |     |    |
| Wall and floor openings near work location have been covered   |     |    |
| Ignition source not to be used near flammable vapors or liquids, or containers that have contained flammable vapors or liquids |     |    |
| Fire hazards that can't be moved protected by appropriate means  |     |    |
|  |     |    |
|  |     |    |
| Equipment to be used is in good condition and inspected regularly  |     |    |
| On-site contractors advised of hot work  |     |    |
| Warning sign(s) posted to warn other workers   |     |    |
| If working in confined space, confined space permit has been issued  |     |    |
| Inspect work area after work is complete   |     |    |
| Maintain a fire watch during operations and for 30 minutes after work has been completed                                       |     |    |
|  |     |    |

Authorized Signature Date

For specific requirements, refer to General Industry Standards 1910.146, 1910.252, 1910.253, 1910.254, 1910.272, and Construction Standards 1926.803, 1926.350, 1926.352, 1926.343.

## **MATERIAL HANDLING AND STORAGE**

### **GENERAL**

When storing materials, do not leave materials in aisles, walkways, stairways, roads or other points of entry or exit. When moving or lifting materials by hand, avoid stress or strain.

Flammable liquids and grease shall be stored in a "No Smoking" area and properly separated from other stored material.

Each container will be identified as to its contents.

"Hitching a ride" on tractors, cranes, forklifts or other vehicles is dangerous. Ride in cab of truck or where seat is provided. Jumping on/off moving vehicle is prohibited.

### **STACKING**

Materials should be segregated as to kind, size and length, and placed in neat and orderly stacks that are racked, blocked or interlocked to prevent falling, collapsing or tripping hazards.

Stacks of materials will be arranged to allow passageways between them and be well marked and visible at night.

### **RIGGING**

Good rigging is essential for moving construction materials and equipment and at the same time keep them under control.

Never swing loads over the heads of workers in the area.

Only qualified flagmen and signalmen are to direct operation, using hand signals established as standard for the industry.

Use the correct lifting technique and utilize hoisting equipment or engage the help of a fellow worker whenever heavy or unwieldy objects are to be moved.

Use softeners where slings pass over sharp edges or corners.

\*Tag lines must be used to control loads and keep workers away.

Do not overload any part of your rigging. Check loads just off the ground for stability before hoisting. Insure that the center of gravity is directly below the hook.

Never leave a suspended load unattended until safely landed.

Never allow loads, booms, or rigging to approach within ten (10) feet of energized electrical lines rated 50 KV or lower unless the lines are de-energized. For lines rated greater than 50 KV or for moving loads, refer to O.S.H.A. Standards.

- Always operate cranes on firm, level ground or use mats, particularly for near-capacity lifts without-riggers.

Rope off or barricade a space 360 degree around all cranes operating on your jobsite to the extent of the swing radius of the rear of the rotating structure.

#### **Rigging and Sling Safety**

##### **1. Load Angle Factor - Choosing Slings**

To determine the safe working load:



- a. Length of leg (sling) divided by Height to Hook = Load Angle Factor
- b. Load Angle Factor multiplied by Weight of Load = Stress
- c. OR:  $10 \text{ ft.} \div 8 \text{ ft. to hook} = 1.25 \text{ Load Angle Factor}$
- d.  $1.25 \times 2000 = 2500 \text{ lbs...}$  each leg- Safe Working Load Rating for your slings

## 2. Wire Rope

- a. Made from preformed strands
- b. Better load distribution
- c. Prevents unraveling when cut
- d. More flexible
- e. Many uses
- f. Less susceptible to corrosion, overtension, wear and crushing

## 3. Wire Rope Construction

- a. Lay: Direction of winding of wires in strands and strands in rope. Usually, 2 basic lays, Regular Lay and Lang Lay
- b. Regular Lay - Wires are laid in one direction, strands are laid in opposite, Strong, withstands crushing and distortion due to short length of exposed wires
- c. Lang Lay – Wires and strands are laid in same direction. Used in multiple sling hoisting as it has a tendency to untwist

## 4. Synthetic Slings

- a. Available in nylon or polyester
- b. Nylon is resistant to many alkalis
- c. Polyester is resistant to many acids
- d. Polyester stretches only half as much as nylon
- e. Advantages to Synthetic Slings
- f. Width and texture prevent scratches
- g. Very flexible, mold to the shape of the load
- h. Not affected by moisture, no corrosion, non sparking
- i. Can absorb heavier shocks than other materials
- j. Available in a number of configurations

## 5. Slings

- a. Inspect daily for excessive wear
- b. Look for
  - i. Colored threads,
  - ii. Cuts, crushes, abrasions, melts
  - iii. Burns, chemical or heat
  - iv. Knots
- c. Dispose of all slings which show signs of wear. Do not keep them with usable slings.

## 6. Rigging Hardware – Hooks: carbon steel, alloy steel, bronze,

- a. Quenched and tempered
- b. Rated capacity permanently displayed

- c. Anchor Shackles: Screw pin, round pin, safety pin
  - d. Chain Shackles: Screw pin, round pin, safety pin
  - e. Turnbuckles, Eye Bolts, Clips, Load Binders, Chain Falls
7. Weight Determinations
- a. Use drawings, catalogs, bills of lading
  - b. Use information on the load, paint, plate, tagged
  - c. Weigh the load, scale, dynamometer, crane load scale
  - d. Calculate the weight
8. Center of Gravity –
- a. It's directly under the Hook
  - b. The point at which the object will balance
  - c. Locate CG, hook should be directly above it
  - d. If a load tilts when it is lifted, weight on one leg will increase, other will decrease
  - e. *Points of attachment should lie above the CG*

## **Stairways and Ladders**

- Only Type 1AA, Type 1A, Type 1, and Type 2 ladders shall be used on this project. Do not exceed the rated load capacity.
- All ladders shall be inspected before use, and shall be removed from service if broken, damaged or unsafe
  - The above referenced ladder must be tagged “Do Not Use” and reported to the supervisor by the person performing the inspection
  - Ladders shall not be painted or covered in any manner that will hide cracks and other defects
  - Ladders shall have all of the appropriate warning and danger labels in place, maintained in legible condition
- Ladders must be utilized in a manner specified by the manufacturer
- “The Joint Venture” shall determine the type of fall protection that shall be used when working with a ladder on the job site
  - Tying the ladder off, or having a person “spot” the ladder are possibilities
- The ladder must be the appropriate size and type for the work being performed
- Metal ladders shall not be used around electrical equipment such as power lines, transformers and electric panels

### Extension or Straight Ladders shall...

- be pitched at the required 4:1 ratio
- be tied or otherwise secured to the structure or elevated surface to prevent tipping or falling. Do not use the rope designed for adjusting the ladders height to secure the ladder.
- be extended at least 3 feet above the elevated surface to be accessed
  - The top 3 rungs of the extension, or straight ladder shall not be used as a step

### Fixed Ladders shall...

- be made and installed for the environment it is intended to serve
- be manufactured and installed in accordance with the ANSI Standard for Fixed Ladders
  - construction
  - elevations
  - fall protection
  - spacing from walls ( $\geq 7$ " from wall to rung)
- Both permanent and temporary fixed ladders
- be inspected by a “competent person” for structural integrity and general safety

### Job Made Ladders shall...

- be constructed in accordance with the requirements of OSHA and ANSI

### Step Ladders shall...

- be opened completely with spreaders locked in place

- not be used as straight ladders
- be tall enough to perform the necessary work
- The top 2 steps of a step ladder shall not be used for standing

## **LASERS**

- The contractors “competent Person(s)” is responsible for the use of Lasers on the job Site
- Lasers are regulated by their hazards. The laser(s) being used on his site are;



| <b>Class<br/>I</b> | <b>Class<br/>II</b> | <b>Class<br/>IIIa</b> | <b>Class<br/>IIIb</b> | <b>Class<br/>IV</b> |
|--------------------|---------------------|-----------------------|-----------------------|---------------------|
|--------------------|---------------------|-----------------------|-----------------------|---------------------|

- Class II and IIIa lasers are often found on construction sites for the purpose of aligning and leveling.
- In order to use a laser on a construction site, the employee must be properly trained, and have proof of training
- When the laser is not being actively used (breaks, lunch, or other extended periods of > 10 minutes) the laser shall be shut-off.
- The competent person must insure that all entrances to the work area where lasers are being used shall be labeled with the appropriate approved DANGER or WARNING signs that indicate that a Class II or IIIa laser is in use
  - Lasers must have appropriate labels, stickers and warnings affixed, which shall be maintained in good condition
  - Reflective surfaces, including mirrors shall not be located in areas where lasers are in use.
  - Specialized protective eyewear may be required

## **EQUIPMENT GUARDING**

- Machine guarding shall meet the requirements of OSHA
- All exposed blades shall be guarded to prevent accidental injury
- All belts and pulley’s will be protected with a suitable guard to prevent accidental contact
- All table saws shall have the appropriate blade guards, anti-kickback devices and push sticks
- The GC shall be responsible for determining what equipment shall have guards, and the appropriate guard for the equipment or machine.
  - Guards shall be used and installed in accordance with manufacturers specification

## **Permits Required**

**For this project, the following permits will be required;**

☐ **Air Quality  
for  
Demolition**

☐ **Asbestos**

☐ **Building**      ☐ Alteration      ☐ Construction      ☐ Demolition      ☐ Renovation

**Dig safe**

☐ **Dumpster**      ☐ ( $\geq$  6 cubic  
yards)

☐ **Electrical**

☐ **Excavation**

☐ **Fire  
Detection**

\_\_\_\_ **Fire  
Suppression**

☐ **Flammable  
Liquid**

☐ **Gas**      ☐ Natural      ☐ Propane

\_\_\_\_ **Hot Work**

\_\_\_\_ **Plumbing**

\_\_\_\_ **Salamanders**

\_\_\_\_ **Other(s):**

## **AERIAL LIFTS**

- Personnel lifts such as articulating booms, single person upright lifts (i.e. Genie, JLG and Uprights) and scissors lifts shall be used in a manner specified by the manufacturer, in accordance with the requirements of OSHA 29 CFR 1910.66.
- All articulating booms, including and truck mounted articulating booms are required to have personal fall protection equipment, consisting of approved full body harness and lanyards.
- Scissors Lifts, and Upright Lifts that are equipped with a guardrail system do not require the use of a full body harness and lanyard, as the cage (guardrail) is considered fall protection.
  - **Exception:** If manufacturers specifications or company policy indicate that the full body harness and lanyard (or similar) is required, the use of same shall be mandated.
- **Any person using a personnel lift must be properly trained, in accordance with manufacturer's specifications**
- All lifts shall bear the following manuals and warnings, in legible condition;
  - The operators manual shall be located on the lift at all times, for ease of reference
  - All danger and warning stickers shall be attached to the lift and shall be in legible condition
- Personnel lifts shall be inspected before each use, and must be removed from service if a deficiency is noted
  - All safety devices and related equipment shall be tested as part of the inspection for proper operation.
  - The lift, if damaged or otherwise impaired shall be tagged "Do Not Use" to prevent use, until repaired.
    - Lifts shall only be repaired or altered by a service technician approved by the manufacturer.
- Whenever a lift is utilized (exterior or interior), the area / site shall be inspected for hazards, which include, but are not limited to;
  - Overhead concerns (i.e. beams and columns, lights, sprinklers, etc.)
  - Flooring and ground abnormalities (i.e. holes, unstable / soft ground, floor vents and grates)

## **POWER TOOLS**

- All hand and power tools shall be maintained in safe condition.
  - Electrical cords shall be without damage or splice.
    - Badly twisted primary and extension cords shall be removed from service
  - On all construction sites, the use of Ground Fault Circuit Interrupters (GFCI) is required.
    - When the electrical service has been completed, inspected and approved for the site, and the temporary service has been removed or is no longer in use, the use of GFCI (including pigtailed and fixed) is still required.
- Guards shall be used on all equipment with exposed and moving parts that have the potential to place employees at risk.
  - Guards shall have openings small enough to prevent accidental finger access/exposure
  - Guards removed for maintenance and repair shall be replaced immediately after the work is performed
  - If the guard(s) must be removed, the power to the equipment, machine or power tool shall be unplugged or de-energized by circuit breaker or disconnect.
    - See Lock-Out / Tag-Out requirements in the Electrical section
- Blade guards are required for all table saws
  - Push-sticks shall be located next to, and shall be used for work on table saws, as required.
- Air compressors used for pneumatic equipment shall not be used for removing dust or other particulates from clothing or equipment / tools unless the pressure has been regulated down to below 15 psi.
- Any and all tools found to be damaged or defective shall be removed from service, and tagged **"Do Not Use"** to prevent accidental use. Damaged or defective equipment and tools shall include, but not be limited to;
  - missing ground (pin)
  - equipment and tools from which a shock was received
  - equipment, tools and cords that have been taped to cover physical damage
- Contractors using tools in hazardous areas shall verify that the equipment or tools can be used in that type of environment.
  - Flammable and Combustible Liquids - Intrinsically Safe Equipment
  - Wet Areas - Ground Fault Circuit Interrupters

## **SAWS**

- Any automatic cutoff saw that strokes continuously without the operator being able to control each stroke shall not be used.
- Saw frames or tables shall be constructed with lugs cast on the frame or with an equivalent means to limit the size of the saw blade that can be mounted, to avoid over-speed caused by mounting a saw larger than intended.
- A mechanical or electrical power control shall be provided on each machine to make it possible for the operator to cut off the power from each machine without leaving his position at the point of operation.
- All portions of the saw blade shall be enclosed or guarded, except for the working portion of the blade between the bottom of the guide rolls and the table. Band saw wheels shall be fully encased. The outside periphery of the enclosure shall be solid. The front and back of the band wheels shall be either enclosed by solid material or by wire mesh or perforated metal. Such mesh or perforated metal shall be not less than 0.037 inch (U.S. Gage No. 20), and the openings shall be not greater than 3/8". Solid material used for this purpose shall be of an equivalent strength and firmness. The guard for the portion of the blade between the sliding guide and the upper-saw-wheel guard shall protect the saw blade at the front and outer side. This portion of the guard shall be self-adjusting to raise and lower with the guide. The upper-wheel guard shall be made to conform to the travel of the saw on the wheel.
- Hand-fed circular rip saws and hand-fed circular crosscut table saws. Unless fixed or manually adjustable enclosures or guarding provides equivalent protection, hand-fed circular rip saws and hand-fed circular crosscut table saws shall be guarded as follows to keep employees clear of any danger zones.
- All cracked saws shall be removed from service.
- **All table saws must be equipped with a magnetic disconnect switch. This device prevents automatic re-start of the saws motor after a power outage.**



### **Powered Industrial Trucks / Fork Lifts / Lulls**

Powered Industrial Trucks (including Forklifts) shall be operated in accordance with the requirements of **OSHA 29 CFR 1910.178. This includes Certification of Training on the OSHA Powered Industrial Truck Standard.**

**The operator, must at a minimum, must be evaluated every 3 years.**

Contractors/subcontractors are responsible for the safe operation of the powered industrial trucks and shall insure that the following requirements are met;

The operator is capable of operating the forklift.

The operator has a current Massachusetts hydraulic license. **(Department of Public Safety)**

The operator has proof of training, and documentation to prove successful completion of a class, such as a certification card.

The powered industrial trucks used on this job site have been inspected by an authorized representative of the manufacturer within the last year.

All manuals, tags, labels and warnings are in place on the truck, and are legible.

The powered industrial truck has been evaluated for operation within the building.

Lifts used inside shall have carbon monoxide scrubbing systems or be properly exhausted to prevent carbon monoxide accumulation.

## **Site Security**

### **Pedestrian, Personnel and Vehicle Protection**

- “The Joint Venture” shall discuss site security and personnel and vehicle safety with the owner, before any work is initiated.
- It is the responsibility of “The Joint Venture” to, when necessary, meet with and address any issues that may fall under the jurisdiction of the local fire and police departments.
- Contractors, coordinating with “The Joint Venture” shall take steps necessary to protect the public and maintain work areas that meet or adjoin public ways, sidewalks, building entrances (aisles, corridors, lobbies and other common areas), stairways and roads.
  - The contractor shall erect, install and maintain the appropriate barricades, barriers, fences, guardrails, overhead protection, partitions, signs, shields, and/or other interim controls protect the health, safety and well-being of the general public.
    - Warning signs must be conspicuously posted and adequate in number for protection of the general public.
    - When signs used for exits must be temporarily blocked or obstructed, the signs shall be covered or otherwise blanked to prevent use.

Temporary exits shall be identified from the former exits with new signage with directional arrows to permit safe egress of the public and workforce.

The Exit signs shall be red or green in color, with each letter at least 6” in height with a  $\frac{3}{4}$ ” stroke (width).

- Work shall only be performed during appropriate hours, subject to the requirements of the city or town, and as specified by contract.
- All guardrails to protect the general public and workforce from the potential of fall shall be of adequate strength, and shall be able to withstand a down and outward pressure of 200lbs, in accordance with OSHA

## **Smoking**

**Smoking is not allowed on school grounds!**

## **Motor Vehicles**

All vehicles, regardless of size shall be operated by a competent, licensed operator in accordance with the requirements of the appropriate state, Department of Transportation (DOT) and Registry of Motor Vehicles (RMV).

Any vehicle greater than 26,000lbs, or as specified by the owner, general contractor shall have operators who are evaluated randomly, or as needed for alcohol and drugs as specified by the Department of Transportation.

- Any operator, believed to be under the influence of alcohols, drugs or other medication (including over-the-counter) cough/cold and/or sleep medications shall be removed from vehicle operation, tested in accordance with the DOT and, if determined to be under the influence, shall be driven home by a means other than by themselves in their respective vehicle.
- Any vehicle greater than 10,000 lbs. or higher.
- Vehicles shall be inspected, repaired or serviced by qualified mechanics / personnel.
- All vehicles shall be inspected before each shift by the operator / competent person. All safety issues shall be immediately repaired, or the vehicle removed from service and labeled as out-of-service to prevent unauthorized operation or use.
- Vehicle operators shall not, while driving, utilize cell phones or consume food and/or beverages.
- Vehicle operators shall not operate vehicles unless seat belts are in use
- Vehicles used for the transport of materials shall have the materials properly secured and/or covered.
  - Dump trucks shall utilize covers or tarps when transporting any material over a public way
  - Gas cylinders shall be transported in the upright position, and shall be secured by chain or strap
- Vehicles in tow shall be attached by solid bar, not by chain
- All construction vehicles shall be equipped with the appropriate, charged, inspected and conspicuously placed fire extinguisher
- All passengers in a vehicle shall be seated and shall wear seat belts.
  - Personnel shall not be permitted to ride in the cargo area or pick-up body regardless of length of trip.
- Vehicles not in use shall have the keys removed from the ignition, and placed in a safe location to prevent unauthorized use.
- Riding within the bed of pickup trucks is prohibited.

## **Weather Conditions**

### 1. Spring

- Thawing – ground that was once frozen may now be subject to thawing action. Care must be taken when placing heavy loads on ground level that may shift due to thawing action.

### 2. Summer

- Heat Related Illnesses – the Emergency Action Plan must be kept up to date in order to handle heat related illnesses such as heat exhaustion and heat stroke which may arise in the summer months.
- First Aid – members of the Emergency Action Plan must be properly trained in order to handle such heat related illnesses.
- Drinking Water – adequate potable drinking water must be provided on site so that the workers can drink ample fluids throughout the day.

### 3. Autumn

- Housekeeping – fallen leaves, branches, limbs, etc... that may create a housekeeping situation on must be cleaned up before it creates a slip/fall hazard.

### 4. Winter

- Clothing – adequate layers of clothing must be worn so that the workers are adequately protected from frigid conditions.
- Snow and Ice – all outside work areas, walkways, sidewalks, etc... must be properly cleared, sanded/salted and maintained to prevent a possible slip hazard.
- Cold Related Illnesses – the Emergency Action Plan must be kept up to date in order to handle cold related illnesses such as frost bite and hypothermia, which could arise during the winter months.
- First Aid – members of the Emergency Action Plan must be properly trained in order to handle cold related illnesses.
- Building Access – if permanent elements of the building design are missing during construction (i.e. snow guards, gutters, canopies, etc...), and then attention should be given to those accessible areas around the building perimeter in order to deal with the elements such as rain and snow.

## ACCIDENT INVESTIGATION REPORT

|                                    |
|------------------------------------|
| Date & Time of Accident:           |
| Location:                          |
| Accident Description:              |
| Workers Involved:                  |
| Preventive Action Recommendations: |
| Corrective Actions Taken:          |

## ACTIVE SHOOTER

An Active Shooter is an individual actively engaged in killing or attempting to kill people in a confined and populated area; in most cases, active shooters use firearms(s) and there is no pattern or method to their selection of victims.

Active shooter situations are unpredictable and evolve quickly. Typically, the immediate deployment of law enforcement is required to stop the shooting and mitigate harm to victims.

Because active shooter situations are often over within 10 to 15 minutes, before law enforcement arrives on the scene, individuals must be prepared both mentally and physically to deal with an active shooter situation.

### Good practices for coping with an active shooter situation:

- ☐ Be aware of your environment and any possible dangers
  - ☐ Take note of the two nearest exits in any facility you visit
  - ☐ If you are in an office, stay there and secure the door
  - ☐ If you are in a hallway, get into a room and secure the door
  - ☐ As a last resort, attempt to take the active shooter down. When the shooter is at close range and you cannot flee, your chance of survival is much greater if you try to incapacitate him/her.
- 
- ☐ **CALL 911 WHEN IT IS SAFE TO DO SO!**

## HOW TO RESPOND WHEN AN ACTIVE SHOOTER IS IN YOUR VICINITY

Quickly determine the most reasonable way to protect your own life.

- 1. Evacuate.** If there is an accessible escape path, attempt to evacuate the premises. Be sure to:
  - ☐ Have an escape route and plan in mind
  - ☐ Evacuate regardless of whether others agree to follow
  - ☐ Leave your belongings behind
  - ☐ Help others escape, if possible
  - ☐ Prevent individuals from entering an area where the active shooter may be
  - ☐ Keep your hands visible
  - ☐ Follow the instructions of any police officers
  - ☐ Do not attempt to move wounded people
  - ☐ Call 911 when you are safe
- 2. Hide out.** If evacuation is not possible, find a place to hide where the active shooter is less likely to find you. Your hiding place should:
  - ☐ Be out of the active shooter's view
  - ☐ Provide protection if shots are fired in your direction (i.e., an office with a closed and locked door)
  - ☐ Do not trap yourself or restrict your options for movement

- ☐ To prevent an active shooter from entering your hiding place:
  - ☐ Lock the door
  - ☐ Blockade the door with heavy furniture

**If the active shooter is nearby:**

- ☐ Lock the door
- ☐ Silence your cell phone and/or pager
- ☐ Turn off any source of noise (i.e., radios, televisions)
- ☐ Hide behind large items (i.e., cabinets, desks)
- ☐ Remain quiet

**If evacuation and hiding out are not possible:**

- ☐ Remain calm
- ☐ Dial 911, if possible, to alert police to the active shooter's location
- ☐ If you cannot speak, leave the line open and allow the dispatcher to listen

**3. Take action against the active shooter.** As a last resort, and only when your life is in imminent danger, attempt to disrupt and/or incapacitate the active shooter by:

- ☐ Acting as aggressively as possible against him/her
- ☐ Throwing items and improvising weapons
- ☐ Yelling
- ☐ Committing to your actions

**HOW TO RESPOND WHEN LAW ENFORCEMENT ARRIVES**

Law enforcement's purpose is to stop the active shooter as soon as possible. Officers will proceed directly to the area in which the last shots were heard.

- ☐ Officers usually arrive in teams of four (4)
- ☐ Officers may wear regular patrol uniforms or external bulletproof vests, Kevlar helmets, and other tactical equipment
- ☐ Officers may be armed with rifles, shotguns, handguns
- ☐ Officers may use pepper spray or tear gas to control the situation
- ☐ Officers may shout commands, and may push individuals to the ground for their safety.

**How to react when law enforcement arrives:**

- ☐ Remain calm and follow officers' instructions
- ☐ Put down any items in your hands (i.e., bags, jackets)
- ☐ Immediately raise hands and spread fingers
- ☐ Keep hands visible at all times
- ☐ Avoid making quick movements toward officers such as holding on to them for safety
- ☐ Avoid pointing, screaming and/or yelling
- ☐ Do not stop to ask officers for help or direction when evacuating, just proceed in the direction from which officers are entering the premises

**Information to provide to law enforcement or 911 operator:**

- ☐ Location of the active shooter
- ☐ Number of shooters, if more than one
- ☐ Physical description of shooter/s
- ☐ Number and type of weapons held by the shooter/s
- ☐ Number of potential victims at the location

**Notes:** The first officers to arrive to the scene will not stop to help injured persons. Expect rescue teams comprised of additional officers and emergency medical personnel to follow the initial officers. These rescue teams will treat and remove any injured persons. They may also call upon able-bodied individuals to assist in removing the wounded from the premises.

Once you have reached a safe location or an assembly point, you will likely be held in that area by law enforcement until the situation is under control, and all witnesses have been identified and questioned. Do not leave until law enforcement authorities have instructed you to do so.

**Date inspection conducted:** \_\_\_\_\_ **Location:** \_\_\_\_\_

**Name(s) of those participating in this inspection:** \_\_\_\_\_

**INDICATE EITHER: A = Acceptable/Yes; U = Unacceptable/No; N/A = Not Applicable**

| PERSONAL PROTECTIVE EQUIPMENT                          |  | EMERGENCY ITEMS  |  |
|--|--|--|--|
| Safety glasses and/or goggles available + being used?  |  | Emergency evacuation map posted near work area?        |  |
| Protective eyewear use is specified in writing?        |  | Emergency phone numbers posted and known by all?       |  |
| Face shield available for bulk liquid tasks? Grinding? |  | Emergency eyewash and/or shower units accessible?      |  |
| Hand protection used/worn as required?                 |  | First aid kit available at work site?                  |  |
| Foot protection worn as required?                      |  | First aid trained competent person available?          |  |
| Hearing protection worn where required?                |  | BBP kit available/BBP trained individual on site?      |  |
| Hard hats worn when falling object hazard is present?  |  | Fire extinguishers readily available (not blocked)?    |  |
| Supplies on hand for incidental chemical spills?       |  | Fire extinguishers inspected monthly/yearly as needed? |  |

| ELECTRICAL SAFETY ISSUES  |  | ELECTRICAL SAFETY ISSUES   |  |
|---|--|--|--|
| GFCI's used for all portable electrical hand tools?   |  | Strain relief integrity for cords and plugs in tact?   |  |
| Extension cords rated for hard or extra hard usage? (2 wire ribbon cord is unacceptable for industrial usage) |  | For extension cords; hard usage cord includes three wire cord marked = S, ST, SO, STO, SJ, SJO, SJT + SJTO |  |
| Certified or listed equipment is used per manufacturer?   |  | Electrical cords inspected & have all prongs in tact?  |  |
| Electrical panels are labeled appropriately?  |  | Strain relief in tact for all flexible cords & plug fittings?  |  |
| Electrical panel knockouts are in place?  |  | Portable generators are grounded per NEC requirements?   |  |
| Light bulbs for illumination protected from breakage?   |  | Electric power tools are double insulated or grounded?   |  |



| CONSTRUCTION SAFETY & HEALTH ISSUES                     |  | CONSTRUCTION SAFETY & HEALTH ISSUES                            |  |
|---|--|--|--|
| General housekeeping is neat and orderly?               |  | Flammable liquids are in OSHA/FM metal safety cans?            |  |
| MSDS openly available to all employees?                 |  | Flammable liquids storage containers labeled properly?         |  |
| Concrete work? Silica dust training documented for all? |  | Fire extinguisher readily available, accessible + inspected?   |  |
| All hazardous containers labeled appropriately?         |  | Impact style air tools have safety clips or retainers on them? |  |
| Lockout/Tagout is being used for appropriate tasks?     |  | Pneumatic power tools have hoses secured?                      |  |
| Hot work permits used for grinding, cutting, welding?   |  | Compressed air used for cleaning limited to 30 psi ?           |  |
| Confined space entry work? Check training/permit/etc.   |  | Compressed gas cylinders not in use have caps in place?        |  |

Copy the completed inspection sheet to: \_\_\_\_\_

If marked "U" for unacceptable or no; list the appropriate corrective action on the reverse side

| CONSTRUCTION SAFETY & HEALTH ISSUES                         |  | CONSTRUCTION SAFETY & HEALTH ISSUES                         |  |
|---|--|---|--|
| Compressed gas cylinders stored secured + upright?          |  | Wall openings + floor holes are covered or guarded?         |  |
| Oxygen/acetylene torch units have flash back arrestors?     |  | 100% fall protection in place above 6 feet in height?       |  |
| Grinders (portable + stationary) have guards in place?      |  | Employees operating lifts are trained on the equipment?     |  |
| Stationary grinding wheel tool rest is 1/8 inch or less?    |  | Fall protect. full body harness+ lanyard used at all times? |  |
| Stationary grinding wheel tongue guard is 1/4 inch or less? |  | Excavation? Ladders used > 4 feet deep? Extend 3 feet?      |  |
| Grinders are inspected, ring tested + free of defects?      |  | Excavation? Protection from cave-ins for >5 feet deep?      |  |
| Safety glasses + face shield used for grinding tasks?       |  | Rebar caps used for protruding reinforced steel posts?      |  |

| CONSTRUCTION SAFETY & HEALTH ISSUES                         |  | CONSTRUCTION SAFETY & HEALTH ISSUES                           |  |
|---|--|---|--|
| Ladders are safe and inspected as appropriate?              |  | Portable circular saws equipped with protective guards?       |  |
| Stair rails = req'd at 30" change in elevation or 4 risers? |  | Unsafe hand tools are prohibited?                             |  |
| Stairs or ladder provided for access points > 19" high?     |  | Impact tools, hammers kept free of splinters/mushrooms?       |  |
| Extension + straight ladders extend 3' beyond landing?      |  | Wire rope used for lifting? Deterioration is absent?          |  |
| Stepladder or commercial stepstool used for high access?    |  | Web slings used for lifting? Deterioration is absent?         |  |
| Step ladders are only used in open position?                |  | Crane use? Written lift plan on file listing load capacities? |  |
| Scaffolding = guardrails used? competent person on site?    |  | Hooks used for lifting have safety latch in place?            |  |

## CORRECTIVE ACTION PLAN

| LIST ITEM, THE PERSON RESPONSIBLE AND EXPECTED COMPLETION DATE ! |                           |                  |        |
|--|---------------------------|------------------|--------|
| ACTION ITEM  | PERSON (S)<br>RESPONSIBLE | TO BE<br>DONE BY | STATUS |
|  |                           |                  |        |
|  |                           |                  |        |
|  |                           |                  |        |
|  |                           |                  |        |
|  |                           |                  |        |
|  |                           |                  |        |
|  |                           |                  |        |
|  |                           |                  |        |
|  |                           |                  |        |
|  |                           |                  |        |
|  |                           |                  |        |

Status column should be marked = either listed as "open", "in process, or "closed"

Signature of lead inspector: \_\_\_\_\_

## LIFT TRUCK DAILY INSPECTION CHECKLIST

TRUCK ID # \_\_\_\_\_ MAKE \_\_\_\_\_

DATE \_\_\_\_\_ SHIFT \_\_\_\_\_

HOUR METER READING: START \_\_\_\_\_ END \_\_\_\_\_

*PLACE AN O.K. IN THE CORRECT COLUMN IF THE ITEM IS WITHOUT DEFECT*

| ITEM                 | Start of shift | During shift | End of shift | Comments if not O.K. |
|----------------------|----------------|--------------|--------------|----------------------|
| Lights               |                |              |              |                      |
|                      |                |              |              |                      |
| Tires                |                |              |              |                      |
|                      |                |              |              |                      |
| Brakes               |                |              |              |                      |
|                      |                |              |              |                      |
| Horn                 |                |              |              |                      |
|                      |                |              |              |                      |
| Hour meter & gauges  |                |              |              |                      |
|                      |                |              |              |                      |
| Steering             |                |              |              |                      |
|                      |                |              |              |                      |
| Hydraulic controls   |                |              |              |                      |
|                      |                |              |              |                      |
| Other:               |                |              |              |                      |
| If applicable:       |                |              |              |                      |
| Battery Connections  |                |              |              |                      |
| Charge               |                |              |              |                      |
| Fuel level           |                |              |              |                      |
| Oil level & pressure |                |              |              |                      |
| Water level          |                |              |              |                      |
| Fan Belt             |                |              |              |                      |
|                      |                |              |              |                      |
|                      |                |              |              |                      |

Overall remarks: \_\_\_\_\_

Defects reported to: \_\_\_\_\_

Operator's Signature: \_\_\_\_\_

**DO NOT OPERATE AN UNSAFE LIFT TRUCK**

## HOT WORK PERMIT

Company Name:

Work Location:

Start Time:

Date:

Type of Work:

Finish Time:

### CHECKLIST FOR HOT WORK

|  | Yes | No |
|--|-----|----|
| Person doing hot work has been trained in safe operation of equipment  |     |    |
| Appropriate PPE (eye protection, helmet, protective clothing, respirator, gloves, etc.) available                              |     |    |
| Welding flash screens will be used   |     |    |
| Charged, Inspected Fire extinguishers placed for immediate use   |     |    |
| Floors swept clean of combustible materials  |     |    |
| Combustible floors protected with fire-resistant shields   |     |    |
| Combustible materials and supplies moved away from hot work location or adequately covered.                                    |     |    |
| Wall and floor openings near work location have been covered   |     |    |
| Ignition source not to be used near flammable vapors or liquids, or containers that have contained flammable vapors or liquids |     |    |
| Fire hazards that can't be moved protected by appropriate means  |     |    |
|  |     |    |
|  |     |    |
| Equipment to be used is in good condition and inspected regularly  |     |    |
| On-site contractors advised of hot work  |     |    |
| Warning sign(s) posted to warn other workers   |     |    |
| If working in confined space, confined space permit has been issued  |     |    |
| Inspect work area after work is complete   |     |    |
| Maintain a fire watch during operations and for 30 minutes after work has been completed                                       |     |    |
|  |     |    |

Authorized Signature Date

For specific requirements, refer to General Industry Standards 1910.146, 1910.252, 1910.253, 1910.254, 1910.272, and Construction Standards 1926.803, 1926.350, 1926.352, 1926.343.

## NEAR-MISS REPORT

|   |  |
|---|--|
| <i>(Enter company name and address)</i>   |  |
| 1. Name of Person involved (Last, First, Middle Initial)  | 2. Title/Position of Person Involved   |
| 3. Name of Person Completing Form (Last, First, Middle Initial)   | 4. Title of Person Completing Form   |
| 5. Department   | 6. Contact Phone Number  |
| 7. Witness Name (Last, First, Middle Initial)   | 8. Witness Phone Number  |
| 9. Date & Time of Incident<br>Date: _____<br>Time: _____<br>AM/PM   | 10: Near-Miss Location – Site of Incident (Building name, Room No., Stairs, Hallway, etc.)<br>If outside of building, give location in reference to nearest building.<br>_____<br>_____<br>_____ |
| 11. Near-Miss Description (Describe fully the protocol/procedures being followed including all substances, equipment, and machinery being used which was related to the near-miss Use additional sheets if necessary)<br>_____<br>_____<br>_____<br>_____<br>_____  |  |
| 12. Personal Protective Equipment (PPE) Used (if applicable)<br>_____<br>_____  |  |
| 13. Severity – Circle the level of severity which you feel could occur if such an incident evolved (Example: High = fatality, permanent disability, high dollar loss; Medium = temporary disability, some dollar loss; Low = minor or no injury, no lost dollar. Consider such factors as physical injuries, damage to equipment or property, and environmental impact)<br>HIGH MEDIUM LOW  |  |
| 14. Probability – Circle the level of probability that a person or property may be exposed to a similar situation, and that required hazards or system failures may be present or likely. (Example: High = tasks occur frequently and by numerous individuals; Medium = tasks occur on a regular basis by certain individuals; Low = tasks occur infrequently by few individuals. Also consider such criteria as complexity of the system, latent and human factors, etc.)<br>HIGH MEDIUM LOW |  |

15. Corrective Actions (what should be done or has been done to prevent recurrence of this incident? E.g. employee training, change of procedures, purchasing of equipment, etc.)

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16. Miscellaneous Information (Provide any other information or recommendations which you feel are pertinent to the incident)

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## Shelter-in-Place



Chemical, biological, or radiological contaminants may be released into the environment in such quantity and/or proximity to a place of business that it is safer to remain indoors rather than to evacuate employees. Such releases may be either accidental or intentional. Examples of situations that might result in a decision by an employer to institute "shelter-in-place" include an explosion in an ammonia refrigeration facility across the street, or a derailed and leaking tank car of chlorine on the rail line behind your place of business.

"Shelter-in-place" means selecting an interior room or rooms within your facility, or ones with no or few windows, and taking refuge there. In many cases, local authorities will issue advice to shelter-in-place via TV or radio.

- [Preparing to stay or go](#)
- [Shelter-in-place procedures](#)
- [Additional Information](#)

Related information:

- [Evacuation Elements](#)
- [Fight or Flee?](#)

Show/Hide All

### PREPARING TO STAY OR GO





## SHELTER-IN-PLACE PROCEDURES

Specific procedures for shelter-in-place at a worksite may include the following:



- Close the business.
- If there are customers, clients, or visitors in the building, provide for their safety by asking them to stay - not leave. When authorities provide directions to shelter-in-place, they want everyone to take those steps immediately. Do not drive or walk outdoors.



*Have employees and anyone else in the building call their emergency contacts, then turn on answering systems*

- Unless there is an imminent threat, ask employees, customers, clients, and visitors to call their emergency contact to let them know where they are and that they are safe.





*Close or tape-off all vents in the room used for shelter-in-place*

- Turn on call-forwarding or alternative telephone answering systems or services. If the business has voice mail or an automated attendant, change the recording to indicate that the business is closed, and that staff and visitors are remaining in the building until authorities advise it is safe to leave.
- Quickly lock exterior doors and close windows, air vents, and fireplace dampers. Have employees familiar with your building's mechanical systems turn off all fans, heating and air conditioning systems, and clothes dryers. Some systems automatically provide for exchange of inside air with outside air. These systems, in particular, need to be turned off, sealed, or disabled.
- If you are told there is danger of explosion, close the window shades, blinds, or curtains.
- Gather essential disaster supplies, such as nonperishable food, bottled water, battery-powered radios, first-aid supplies, flashlights, batteries, duct tape, plastic sheeting, and plastic garbage bags.
- Select interior room(s) above the ground floor, with the fewest windows or vents. The room(s) should have adequate space for everyone to be able to sit. Avoid overcrowding by selecting several rooms if necessary. Large storage closets, utility rooms, pantries, copy and conference rooms without exterior windows will work well. Avoid selecting a room with mechanical equipment like ventilation blowers or pipes, because this equipment may not be able to be sealed from the outdoors.
- It is ideal to have a hard-wired telephone in the room(s) you select. Call emergency contacts and have the phone available if you need to report a life-threatening condition. Cellular telephone equipment may be overwhelmed or damaged during an emergency.



*Tape plastic sheeting over vents, windows, and doors to prevent contaminated air from entering the room*

- Take your emergency supplies and go into the room you have designated. Seal all windows, doors, and vents with plastic sheeting and duct tape or anything else you have on hand.
- Consider precutting plastic sheeting (heavier than food wrap) to seal windows, doors, and air vents. Each piece should be several inches larger than the space you want to cover so that it lies flat against the wall. Label each piece with the location of where it fits. [See image at right]
- Write down the names of everyone in the room, and call your business' designated emergency contact to report who is in the room with you, and their affiliation with your business (employee, visitor, client, customer).
- Listen to the radio, watch television, or use the Internet for further instructions until you are told all is safe or to evacuate. Local officials may call for evacuation in specific areas at greatest risk in your community.

## **Fine Classification System for Unsafe Acts/Conditions at Fontaine Bros. Inc. Construction Projects**

This document outlines Fontaine Bros. Inc. program to fine companies, not individuals, whose employees are uncooperative in maintaining a safe site as part of the Projects Disciplinary Action Program. The subcontractor agrees to adhere to the fine schedule for violations about which he/she was notified by the site Supervisor, Project Manager, or Construction Management Representative and their agents.

The subcontractor agrees to have these fines withheld from monies due him/her. Any violation of this agreement will be cause for suspension of operations until the agreement is fully complied with. All monetary amounts outlined may be doubled for a second offense.

At the conclusion of the project, all funds collected will be donated on the behalf of the contractors employed on the project to a local charity.

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Authorized Signature    Fontaine Bros. Inc.

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Name of Subcontractor/Individual

---

Subcontractor Authorized Signature

---

Company Name

---

Date

| <b>Fine</b> | <b>Item #</b> | <b>Project Management</b>  |
|-------------|---------------|--|
| \$200       | A1            | Any action or in-action which could result in permanent injury or death will be fined with no warning. This may result in dismissal of worker and immediate foreman. |
| \$100       | A2            | Employees did not receive safety training.   |
| \$100       | A3            | New employee did not attend safety orientation.  |
| \$100       | A4            | All employees did not attend and sign a weekly safety meeting.   |
| \$100       | A5            | Appropriate first-aid supplies were not available on project.  |
|             |               | <b>Hazard Communication</b>  |
| \$100       | B1            | Written Haz-Com program is not immediately available.  |
| \$100       | B2            | Reliable procedure is not established for hazard communication.  |
| \$100       | B3            | All employees have not received Haz-com training.  |
| \$100       | B4            | Containers are not properly labeled.   |
| \$100       | B5            | Complete SDS Index not available on project.   |
|             |               | <b>Electrical</b>  |
| \$100       | C1            | Approved GFCI is not in use on all 120 volt, single-phase, 15 & 20 ampere receptacle outlets which are not part of the permanent structural wiring.                  |
| \$100       | C2            | Daily visual inspection of cords, plugs, tools, equipment, etc. not conducted.   |
|             |               | <b>Fire Protection</b>   |
| \$100       | D1            | Employees have not been trained in evacuation, emergency firefighting response and equipment use.  |
| \$100       | D2            | Adequate number of fire extinguishers is not available.  |
| \$100       | D3            | "Hot Work" permit not obtained.  |
|             |               | <b>Construction Area</b>   |
| \$100       | E1            | General Duty Clause Violation  |
| \$100       | E2            | Defective tools and equipment are not tagged to prevent use.   |
| \$100       | E3            | Electrical cords are not routed away from stairways, walkways and driveways.   |
| \$100       | E4            | Flammable and combustibles are not stored properly.  |
| \$100       | E5            | Fire extinguishers are not fully charged, inspected and tags current.  |
|             |               |  |
|             |               | <b>Housekeeping</b>  |
| \$100       | F1            | Debris not removed on regular basis  |
| \$100       | F2            | Building exits obstructed  |
| \$100       | F3            | Snow, ice, water not removed as necessary.   |
| \$100       | F4            | Material staging area not reasonably organized   |
| \$100       | F5            | Nails not removed from lumber.   |
|             |               |  |
| <b>Fine</b> | <b>Item #</b> | <b>Flammable and Combustible Liquids</b>   |
| \$100       | G1            | Storage and handling containers not approved and labeled.  |

|       |    |   |
|-------|----|---|
| \$100 | G2 | Inside storage not in compliance with regulations   |
| \$100 | G3 | Required firefighting equipment not properly located and fully operational  |
| \$100 | G4 | Outside storage not in compliance with regulations.   |
| \$100 | G5 | Flammable and combustible liquids stored in passage ways, stairways and exits.  |
| \$100 | G6 | "Danger, no smoking" signs not posted.  |
| \$100 | G7 | Storage location not at required distance from buildings.   |
| \$100 | G8 | Storage cabinets not available where required.  |
|       |    | <b>Compressed Gas Cylinders</b>   |
| \$100 | H1 | Cylinder hoisting not performed properly.   |
| \$100 | H2 | Cylinder valves not closed with caps in place.  |
| \$100 | H3 | Oxygen and gas cylinders not separated by a fire-resistant partition or required distance.                              |
| \$100 | H4 | Cylinders not upright and secured   |
|       |    | <b>Temporary Electrical</b>   |
| \$100 | I1 | Extension cords not 3-wired and rated for hard or extra hard usage.   |
| \$100 | I2 | Temporary lighting not properly supported, protected and adequate.  |
| \$100 | I3 | Circuits not properly labeled, grounded and inspected.  |
| \$100 | I4 | Breakers not adequately labeled   |
|       |    | <b>Signs and Barricades</b>   |
| \$100 | J1 | Proper fences, barricades and signs not properly installed to warn persons of a potential hazard                        |
|       |    | <b>Site Clearing</b>  |
| \$100 | K1 | Dig Safe not contacted.   |
| \$100 | K2 | Overhead or adjacent utilities, encumbrances, structures, etc. not identified and protected.                            |
| \$100 | K3 | Dig Safe numbers not current.   |
|       |    | <b>Trenching and Excavation</b>   |
| \$200 | L1 | Employees not protected from cave-ins, sliding, falling, or rolling loads, hazardous atmospheres or water accumulation. |
| \$200 | L2 | Excavation in excess of 20 feet deep, protective system not designed by a qualified person(s).                          |
| \$100 | L3 | Safe access not provided for employees.   |
| \$200 | L4 | Protective systems defective, damaged or improperly installed   |
| \$200 | L5 | Proper slopes or benching not maintained, spoil piles not 2 feet or more from edge of bank.                             |
| \$100 | L6 | A trained competent person not available to monitor all excavation procedures.  |
| \$100 | L7 | Soil not tested by a competent person to determine soil type  |
| \$100 | L8 | Excavations not properly barricaded.  |
| \$100 | L9 | Excavations not inspected as required.  |
|       |    | <b>Ladders and Stairways</b>  |

|       |    |   |
|-------|----|---|
| \$100 | M1 | Employees not trained in ladder and stairway safety by a competent person.  |
| \$100 | M2 | Ladders not inspected regularly.  |
| \$100 | M3 | Stair rails, hand rails, and guard rails missing.   |
| \$100 | M4 | Ladders not tagged to indicate type and capacity.   |
| \$100 | M5 | Job-made ladders not constructed as required.   |
| \$100 | M6 | Employee using a ladder in an unsafe manner   |
|       |    | <b>Scaffolding</b>  |
| \$100 | N1 | Guard rails with toe boards not installed as required.  |
| \$100 | N2 | Scaffold not erected plumb, level and secured.  |
| \$100 | N3 | Safe access not provided for scaffolds.   |
| \$100 | N4 | Scaffold components and accessories not defect free.  |
| \$100 | N5 | Scaffolding not designed, erected, dismantled, moved or altered under the supervision of a trained, competent person.                         |
| \$100 | N6 | Scaffold overloading.   |
| \$100 | N7 | Improper scaffold access  |
|       |    | <b>Personal Protective Equipment</b>  |
| \$100 | O1 | Fall protection/full arrest equipment not used when and where they are required.  |
| \$100 | O2 | Approved hard hats not worn by all employees.   |
| \$100 | O3 | Required eye protection not used.   |
| \$100 | O4 | Required reflective vest/clothing not used.   |
| \$100 | O5 | Proper respiratory protection not provided  |
|       |    | <b>Fall Protection</b>  |
| \$100 | P1 | Floor, wall and roof openings not protected with standard guards rails or solid covers.   |
| \$100 | P2 | Open sides of roofs, floors, platforms, bridges, decks, etc. Not properly protected.  |
| \$100 | P3 | Guard rails not maintained and in compliance.   |
|       | P4 | Personal fall arrest not used or is not used correctly  |
| \$100 |    | <b>Power Tools</b>  |
| \$100 | Q1 | Tools are not properly grounded.  |
| \$100 | Q2 | Employees not trained to use power tools safely.  |
| \$100 | Q3 | Required guards not in place and operational.   |
|       |    |   |
|       |    | <b>Concrete</b>   |
| \$100 | S1 | Protruding reinforcing steel onto or into which any employees could fall not guarded to eliminate the hazard of impalement.                   |
| \$100 | S2 | Workers not trained to avoid the hazards of concrete burns and inhalation of dust.  |
| \$100 | S3 | Personal protective equipment such as gloves, boots, hard hats eye and face protection not used.  |
| \$100 | S4 | Form work has not been designed, fabricated, erected, supported, braced and maintained to support vertical and lateral loads without failure. |

|             |               |   |
|-------------|---------------|---|
| \$100       | S5            | Safe shoring and form removal procedures not established.   |
| \$100       | S6            | Required distances not maintained between overhead electrical power lines and concrete placement equipment.                                       |
|             |               | <b>Masonry</b>  |
| \$100       | T1            | Walls not properly supported.   |
| \$100       | T2            | Controlled access zone not established as required.   |
| \$100       | T3            | Planking not scaffold grade.  |
| \$100       | T4            | Respiratory protection not used during sawing, mortar mixing or other silica dust generating activities.  |
| \$100       | T5            | Masonry saws not properly grounded.   |
|             |               | <b>Structural Steel</b>   |
| \$100       | U1            | Workers not using the required fall protection, arrest equipment.   |
| \$100       | U2            | The area beneath the steel erection not designated off limits to unauthorized employees.  |
| \$100       | U3            | Hoisting equipment and accessories not inspected as required.   |
| \$100       | U4            | Tag lines not used to control loads.  |
| \$100       | U5            | Proper erection bolting and bracing procedures not followed.  |
| \$100       | U6            | Floor and roof openings not protected.  |
|             |               | <b>Welding</b>  |
| \$100       | V1            | Employees have not been properly trained in welding and cutting operations.   |
| \$100       | V2            | Flash screens not used where required.  |
| \$100       | V3            | Fire extinguisher not provided near hot-work locations.   |
| \$100       | V4            | Torches, hoses, gauges, regulators, etc. not free of defects.   |
| \$100       | V5            | Compressed gas cylinders are not stored and used properly, secured upright, caps on when not in use, segregated from electrical and heat hazards. |
|             |               | <b>Motor Vehicles</b>   |
| \$100       | W1            | Operators not properly trained and licensed.  |
| \$100       | W2            | Vehicles not inspected daily before use.  |
| \$100       | W3            | Driver and all passengers not using provided seat restraints.   |
|             |               |   |
| <b>Fine</b> | <b>Item #</b> | <b>Heavy Equipment</b>  |
| \$100       | X1            | Workers "riding" on heavy equipment.  |
| \$100       | X2            | Inspection and maintenance not performed as required.   |
| \$100       | X3            | Operators not properly trained and or authorized.   |
| \$100       | X4            | Audible reverse warning is not operational.   |
| \$100       | X5            | ROPS protection not provided.   |
| \$100       | X6            | Equipment does not have seat belts.   |
| \$100       | X7            | Cab glass must be free of defect/damage.  |
| \$100       | X8            | Access roads not properly maintained.   |
| \$100       | X9            | Fire extinguishers not provided in equipment.   |
|             |               | <b>Cranes</b>   |
| \$200       | Y1            | Overhead power lines not de-energized, removed or protected.  |

|             |               |  |
|-------------|---------------|--|
| \$200       | Y2            | Required distance not maintained from live wires.  |
| \$100       | Y3            | Load capacity and hand signal charts not posted and legible.   |
| \$200       | Y4            | Crane not used as intended by manufacturer.  |
| \$200       | Y5            | Operator not authorized for equipment use.   |
| \$100       | Y6            | Annual inspection certificate missing.   |
| \$100       | Y7            | Inspection and maintenance records not properly logged.  |
| \$100       | Y8            | Glass not free of defects and distortion.  |
| \$100       | Y9            | Trained signal person not used as required.  |
| \$100       | Y10           | Swing radius of counterweight not properly barricaded.   |
| \$100       | Y11           | Crane not positioned on solid level ground.  |
| \$100       | Y12           | Outriggers not used as required.   |
| \$100       | Y13           | Material handling equipment and accessories not inspected prior to use.                                  |
| \$100       | Y14           | Qualified rigger not available as required.  |
|             |               | <b>Aerial Lifts</b>  |
| \$100       | Z1            | Employees using aerial lifts not trained and authorized.   |
| \$100       | Z2            | Manufacturer's operation and safety rules not followed.  |
| \$100       | Z3            | Lift safety not inspected and all controls not tested prior to each day's use.                           |
| \$100       | Z4            | Lift not positioned on solid, level ground   |
| \$100       | Z5            | Load limits exceeding manufacturer's specifications.   |
| \$100       | Z6            | Workers in the lift basket not standing firmly on the floor.   |
| \$100       | Z7            | Workers not using required fall protection/arrest system.  |
|             |               | <b>Demolition</b>  |
| \$100       | AA1           | Not following the demolition plan.   |
| \$100       | AA2           | Dust control inadequate.   |
| \$100       | AA3           | Safety meetings not conducted to keep employees apprised of changing, dangerous or hazardous conditions. |
|             |               | <b>Crystalline Silica</b>  |
| \$100       | BB1           | Worker have not been properly trained to recognize and avoid the potential hazards                       |
| \$100       | BB2           | Adequate ventilation, vacuum system or wet methods not provided.   |
| \$100       | BB3           | A written exposure control plan not developed  |
| \$100       | BB4           | Controls based on Table 1 to minimize silica exposure are not in place                                   |
| <b>Fine</b> | <b>Item #</b> | <b>Confined Space Entry</b>  |
| \$100       | CC1           | Fire extinguishers not readily available.  |
| \$100       | CC2           | Worker not properly trained.   |
| \$200       | CC3           | A comprehensive hazard assessment has not been conducted.  |
| \$200       | CC4           | Required safety equipment not available.   |
| \$100       | CC5           | Entry permit system not completed.   |
| \$200       | CC6           | Atmospheric testing not conducted as required.   |
| \$100       | CC7           | Confined space not adequately ventilated.  |



|       |      |   |
|-------|------|---|
| \$200 | CC8  | All affected persons not trained to understand the hazards, precautions, use of required personal protection. |
| \$100 | CC9  | Properly trained rescue personnel with essential rescue equipment not immediately available.                  |
| \$100 | CC10 | Company safety policy not available.  |
| \$200 | CC11 | Employees have not received safety training.  |

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Section 00 73 00c  
INSURANCE REQUIREMENTS

The Subcontractor, at its own expense, shall purchase and maintain in full force and effect, such insurance in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, insurance policies as outlined below. Such policies shall protect the Contractor from claims which may arise out of or result from the Subcontractor's (or anyone directly or indirectly employed by the Subcontractor) operation's performed under the Contract. The Subcontractor shall be required to provide Certificates of Insurance, and, upon demand, any policy or endorsement, evidencing the following coverage.

- D.1 Insurance covering claims under workmen's compensation, disability benefit and other similar employee benefit acts. Insurance also covering claims for damages because of bodily injury, occupational disease or sickness, or death of his employees with the following limits:

|   |           |
|---|-----------|
| Workmen's Compensation:                   | Statutory |
| Employer's Liability:                     |           |
| Bodily Injury by Accident (per Accident): | \$500,000 |
| Bodily Injury by Disease (per Employee):  | \$500,000 |
| Bodily Injury by Disease (Policy Limit):  | \$500,000 |

- D.2 Commercial General Liability insurance, which shall include a blanket contractual liability insuring the indemnification obligations of this Agreement, broad form property damage liability, and personal injury liability coverage extensions. Such policy shall not exclude X, C, U exposures. Commercial general liability policy shall include products and completed operations liability. Further, products and completed operations liability shall be maintained in full force and effect for a period of three (3) years following final completion of the Work. All coverage required under commercial general liability should be provided on an occurrence form with the following minimum limits: (Per Project Aggregate)

|                        |             |
|------------------------|-------------|
| Each Occurrence        | \$1,000,000 |
| Personal & Adv. Injury | \$1,000,000 |
| Products-Comp Op Agg   | \$1,000,000 |
| General Aggregate      | \$2,000,000 |
| Medical Expense        | \$10,000    |

The required limits may be satisfied by a combination of a primary policy and an excess or umbrella policy.

- D.3 Umbrella form Excess liability coverage covering all work performed by the Subcontractor under this Contract.

| <u>Umbrella Coverage</u> | <u>GMP Amount</u> |
|--------------------------|-------------------|
| \$1,000,000-\$5,000,000  | \$5,000,000       |

- D.4 Automobile Liability (Bodily Injury and Property Damage Liability) including coverage for all owned, non-owned, and hired automobiles. A compulsory Massachusetts automobile policy is acceptable for vehicles registered in Massachusetts only.

|                                  |             |
|----------------------------------|-------------|
| Bodily Injury (per occurrence)   | \$1,000,000 |
| Property Damage (per occurrence) | \$1,000,000 |
| <b>OR</b>                        |             |

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INSURANCE REQUIREMENTS

Bodily Injury and Property Damage (per occurrence) \$1,000,000  
Combined Single Limit.

The policy shall include a CA9948 Pollution Endorsement

- 0.5 Contractor's Equipment Coverage on an "All Risk" basis, covering physical damage to all tools and equipment, including automotive equipment used by the Subcontractor with limits at least high enough to provide for replacement of items critical to Project efforts.

0.6 Contractor's Pollution Liability

The subcontractor shall purchase and maintain coverage for bodily injury and property damage resulting from liability arising out of pollution related exposures such as asbestos abatement, lead paint abatement, tank removal, removal of contaminated soil, etc. The insurance policy shall cover the liability of the subcontractor during the process of removal, storage, transport and disposal of hazardous waste and contaminated soil and/or asbestos abatement. The policy shall include coverage for on-Site and off-Site bodily injury and loss of, damage to, or loss of use of property, directly or indirectly arising out of the discharge, dispersal, release or escape of smoke, vapors, soot, fumes, acids, alkalis, toxic chemicals, liquids or gas, waste materials or other irritants, contaminants or pollutants into or upon the land, the atmosphere or any water source or body of water, whether it be gradual or sudden and accidental. The policy shall also include defense and clean-up costs. The Owner and the MBLC shall be named as additional insureds and coverage must be on an occurrence basis. The amount of coverage shall be as follows unless a higher amount is specified in Section 8 below, in which case the CM shall provide the additional coverage:

|                    |                            |
|--------------------|----------------------------|
| Limit of Liability | \$1,000,000 per occurrence |
|                    | \$3,000,000 aggregate      |

- D.7 If any operations performed within the scope of this Contract require the use of any aircraft or watercraft (owned or unowned), Subcontractor shall maintain liability insurance satisfactory to the Contractor.
- D.8 Fontaine Bros., Inc., CONSTRUCTION MANAGER shall be named "additional insured" on the General Liability, Automobile and Excess Liability (Umbrella) policies. General Liability Additional Insured status shall be specifically provided by Additional Insured Form CG2010(1185), or equivalent, and shall apply on a primary and non-contributing basis before any other Insurance or self-Insurance, including any deductible, maintained by, or provided to the additional insureds, and shall be for the duration of the contract, including the Completed Operations Period. All policies shall be endorsed to Waive all Rights of Subrogation in favor of Fontaine Bros., Inc., and CONSTRUCTION MANAGER. Policies shall not be canceled, materially changed or non-renewed without thirty (30) days advance notice to Fontaine Bros., Inc., CONSTRUCTION MANAGER. *"Failure to provide Additional Insured status shall result in Fontaine Bros., Inc. purchasing and owners & Contractors Protective Liability policy (OCP) on behalf of the Subcontractor. The premium for this policy will be back-charged to your contract"*. In addition, THE OWNER, City of Worcester and Lamoureux Pagano & Associates, Inc. shall be added as additional insureds on the policies aforementioned.
- D.9 Such other kinds of insurance as may be required by the Contractor or by the General Contract Documents, each such policy to be in the amount stipulated in the General Contract Documents unless a different amount is hereinafter designated or is otherwise prescribed in writing by the Contractor.
- D.10 Waiver of Subrogation  
Coverage shall include premium for temporary occupancy. Coverage shall include a Waiver of Subrogation in favor of Fontaine Bros., Inc., Construction Manager, THE OWNER, City of Worcester and Lamoureux Pagano & Associates, Inc.

End of Section



# CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

**IMPORTANT:** If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

|          |                               |                |
|----------|-------------------------------|----------------|
| PRODUCER | CONTACT NAME:                 |                |
|          | PHONE (A/C, No. Ext):         | FAX (A/C, No): |
|          | E-MAIL ADDRESS:               |                |
|          | INSURER(S) AFFORDING COVERAGE |                |
|          | NAIC #                        |                |
|          | INSURER A :                   |                |
| INSURED  | INSURER B :                   |                |
|          | INSURER C :                   |                |
|          | INSURER D :                   |                |
|          | INSURER E :                   |                |
|          | INSURER F :                   |                |

**COVERAGES****CERTIFICATE NUMBER:****REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

| INSR LTR | TYPE OF INSURANCE   | ADDL INSD | SUBR WVD | POLICY NUMBER | POLICY EFF (MM/DD/YYYY) | POLICY EXP (MM/DD/YYYY) | LIMITS   |
|----------|---|-----------|----------|---------------|-------------------------|-------------------------|--|
|          | <b>COMMERCIAL GENERAL LIABILITY</b>   |           |          |               |                         |                         | EACH OCCURRENCE \$   |
|          | <input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> OCCUR   |           |          |               |                         |                         | DAMAGE TO RENTED PREMISES (Ea occurrence) \$                         |
|          |   |           |          |               |                         |                         | MED EXP (Any one person) \$  |
|          |   |           |          |               |                         |                         | PERSONAL & ADV INJURY \$   |
|          | GEN'L AGGREGATE LIMIT APPLIES PER:  |           |          |               |                         |                         | GENERAL AGGREGATE \$   |
|          | <input type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC  |           |          |               |                         |                         | PRODUCTS - COMP/OP AGG \$  |
|          | OTHER:  |           |          |               |                         |                         | \$   |
|          | <b>AUTOMOBILE LIABILITY</b>   |           |          |               |                         |                         | COMBINED SINGLE LIMIT (Ea accident) \$                               |
|          | <input type="checkbox"/> ANY AUTO   |           |          |               |                         |                         | BODILY INJURY (Per person) \$  |
|          | <input type="checkbox"/> OWNED AUTOS ONLY <input type="checkbox"/> SCHEDULED AUTOS  |           |          |               |                         |                         | BODILY INJURY (Per accident) \$                                      |
|          | <input type="checkbox"/> HIRED AUTOS ONLY <input type="checkbox"/> NON-OWNED AUTOS ONLY   |           |          |               |                         |                         | PROPERTY DAMAGE (Per accident) \$                                    |
|          |   |           |          |               |                         |                         | \$   |
|          | <b>UMBRELLA LIAB</b> <input type="checkbox"/> OCCUR   |           |          |               |                         |                         | EACH OCCURRENCE \$   |
|          | <b>EXCESS LIAB</b> <input type="checkbox"/> CLAIMS-MADE   |           |          |               |                         |                         | AGGREGATE \$   |
|          | DED <input type="checkbox"/> RETENTION \$   |           |          |               |                         |                         | \$   |
|          | <b>WORKERS COMPENSATION AND EMPLOYERS' LIABILITY</b>  |           |          |               |                         |                         | <input type="checkbox"/> PER STATUTE <input type="checkbox"/> OTH-ER |
|          | ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) <input type="checkbox"/> Y / N <input type="checkbox"/> N / A |           |          |               |                         |                         | E.L. EACH ACCIDENT \$  |
|          | If yes, describe under DESCRIPTION OF OPERATIONS below  |           |          |               |                         |                         | E.L. DISEASE - EA EMPLOYEE \$  |
|          |   |           |          |               |                         |                         | E.L. DISEASE - POLICY LIMIT \$                                       |

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

**CERTIFICATE HOLDER****CANCELLATION**

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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| Activity ID | Activity Name | Orig Dur<br>(Days) | Start | Finish | Total<br>Float | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 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| Activity ID              | Activity Name                             | Orig Dur<br>(Days)                                      | Start    | Finish   | Total<br>Float | 2018 |    |    |    |    | 2019 |    |    |    | 2020 |    |    |    | 2021 |    |    |    | 2022 |    |    |    | 2023 |    |    |    | 2024 |    |
|--------------------------|---|---|----------|----------|----------------|------|----|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|
|                          |   |   |          |          |                | Q4   | Q1 | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 |
| P1050                    | Solicit Bids for Non-Trade Contractors    | 20  | 12/24/18 | 01/22/19 | 30             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
|                          | P1040                                     | Solicit Bids for Trade Contractors                      | 20       | 12/24/18 | 01/22/19       | 30   |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
|                          | P1020                                     | Execute GMP / Award Trade, Priority Non-Trade Contracts | 20       | 01/23/19 | 02/20/19       | 29   |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
|                          | P1010                                     | Award Remaining Non-Trade Contractors                   | 60       | 02/21/19 | 05/15/19       | 178  |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| Permits                  |   | 97  | 08/31/18 | 01/22/19 | 29             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| PERM 1000                | Foundation/Structure Permit Early Package | 20  | 08/31/18 | 09/28/18 | 89             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| PERM 1010                | Building Permit                           | 20  | 12/24/18 | 01/22/19 | 29             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| Submittals & Fabrication |   | 442   | 06/28/18 | 03/30/20 | 288            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1015                  | Early Enabling Work - EP1                 | 15  | 06/28/18 | 07/19/18 | 0              |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1020                  | Site Work - EP2                           | 20  | 08/31/18 | 09/28/18 | 89             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1030                  | Cast-In-Place Concrete - EP2              | 50  | 08/31/18 | 11/12/18 | 64             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1180                  | Steel Anchor Bolts                        | 40  | 12/28/18 | 02/25/19 | 59             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1100                  | Structural Steel - EP3                    | 100   | 01/02/19 | 05/22/19 | 29             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1050                  | Miscellaneous Metals                      | 100   | 02/21/19 | 07/12/19 | 137            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1110                  | Windows                                   | 150   | 02/21/19 | 09/23/19 | 82             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1270                  | HVAC Basic Materials                      | 60  | 02/21/19 | 05/15/19 | 137            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1280                  | Plumbing Basic Materials                  | 60  | 02/21/19 | 05/15/19 | 42             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1290                  | Electrical                                | 70  | 02/21/19 | 05/30/19 | 42             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1300                  | Fire Protection                           | 100   | 02/21/19 | 07/12/19 | 97             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1330                  | HVAC Roof Top Units - Submittal for Steel | 35  | 02/21/19 | 04/10/19 | 29             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1360                  | Roof Systems                              | 70  | 02/21/19 | 05/30/19 | 152            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1060                  | Framing and Sheathing                     | 100   | 02/21/19 | 07/12/19 | 112            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1470                  | Doors Frames                              | 100   | 02/21/19 | 07/12/19 | 112            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1420                  | Transformers                              | 140   | 02/21/19 | 09/10/19 | 198            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| RW3 1000                 | Switch Gear                               | 140   | 02/21/19 | 09/10/19 | 218            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1040                  | Curtainwalls                              | 150   | 02/21/19 | 09/24/19 | 82             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1440                  | Storefronts                               | 150   | 02/21/19 | 09/24/19 | 166            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1320                  | Boilers, Chillers                         | 120   | 02/21/19 | 08/12/19 | 240            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1340                  | HVAC Pumps & Equipment                    | 140   | 02/21/19 | 09/10/19 | 220            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1230                  | Masonry Veneer                            | 110   | 02/21/19 | 07/29/19 | 330            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1450                  | Applied Fire Proofing                     | 70  | 02/21/19 | 05/31/19 | 214            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1480                  | WDC                                       | 70  | 02/21/19 | 05/31/19 | 290            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1430                  | Elevators                                 | 160   | 02/21/19 | 10/08/19 | 210            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1460                  | HVAC Roof Top Units - Fabrication         | 100   | 04/11/19 | 08/30/19 | 215            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1200                  | Paint                                     | 100   | 05/15/19 | 10/07/19 | 231            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1120                  | Finish Carpentry                          | 120   | 05/16/19 | 11/04/19 | 195            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1130                  | Flooring                                  | 120   | 05/16/19 | 11/04/19 | 240            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1140                  | Porcelain Tile                            | 120   | 05/16/19 | 11/04/19 | 221            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1150                  | Carpeting                                 | 100   | 05/16/19 | 10/07/19 | 260            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1160                  | Casework/Cabinetry                        | 110   | 05/16/19 | 10/21/19 | 245            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1170                  | Countertops                               | 110   | 05/16/19 | 10/21/19 | 245            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1190                  | Doors and Hardware                        | 100   | 05/16/19 | 10/07/19 | 275            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1370                  | Plumbing Fixtures                         | 100   | 05/16/19 | 10/07/19 | 278            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1070                  | Fire Stopping                             | 60  | 08/12/19 | 11/04/19 | 200            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1080                  | Joint Sealants                            | 60  | 08/12/19 | 11/04/19 | 200            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1210                  | Signage                                   | 120   | 09/10/19 | 03/02/20 | 178            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1220                  | Restroom Accessories                      | 80  | 09/10/19 | 01/03/20 | 218            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1240                  | Appliances                                | 100   | 09/10/19 | 01/31/20 | 198            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1310                  | Landscaping                               | 100   | 10/08/19 | 03/02/20 | 298            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| SUB1400                  | Site Furnishings                          | 120   | 10/08/19 | 03/30/20 | 288            |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |
| MEP BIM/3D Coordination  |   | 66  | 03/21/19 | 06/21/19 | 35             |      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |



| Activity ID                    | Activity Name   | Orig Dur<br>(Days) | Start    | Finish    | Total<br>Float | 2018  |    |    |    |    | 2019 |    |    |    | 2020 |    |    |    | 2021 |    |    |    | 2022 |    |    |    | 2023 |    |    |    | 2024 |  |
|--------------------------------|---|--------------------|----------|-----------|----------------|---|----|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|--|
|                                |   |                    |          |           |                | Q1  | Q2 | Q3 | Q4 | Q1 | Q2   | Q3 | Q4 | Q1 | Q2   | Q3 | Q4 | Q1 | Q2   | Q3 | Q4 | Q1 | Q2   | Q3 | Q4 | Q1 | Q2   | Q3 | Q4 | Q1 | Q2   |  |
| M1060                          | MEP Kick-off Meeting                                      | 1                  | 03/21/19 | 03/21/19  | 36             | MEP Kick-off Meeting                                      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| M1050                          | Coordinate and Sign-off - Underslab MEP's & MEP Shafts    | 30                 | 03/22/19 | 05/02/19  | 36             | Coordinate and Sign-off - Underslab MEP's & MEP Shafts    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| M1070                          | Coordinate and Sign-off - Roof                            | 30                 | 04/11/19 | 05/22/19  | 35             | Coordinate and Sign-off - Roof                            |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| 4F1000                         | Coordinate and Sign-off - Third Floor                     | 30                 | 04/22/19 | 06/03/19  | 35             | Coordinate and Sign-off - Third Floor                     |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| M1000                          | Coordinate and Sign-off - Second Floor                    | 30                 | 05/01/19 | 06/12/19  | 35             | Coordinate and Sign-off - Second Floor                    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| M1030                          | Coordinate and Sign-off - First Floor                     | 30                 | 05/10/19 | 06/21/19  | 35             | Coordinate and Sign-off - First Floor                     |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| Construction                   |   | 1058               | 07/06/18 | 08/26/22  | 0              |   |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| Phase 1A - Early Enabling Work |   | 61                 | 07/06/18 | 10/01/18  | 89             |   |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| Site Prep and Grading          |   | 61                 | 07/06/18 | 10/01/18  | 89             |   |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| SITE1000                       | Mobilization  | 0                  | 07/06/18 |           | 0              | Mobilization  |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| SITE2230                       | Site Reconnaissance - Ledge                               | 10                 | 07/06/18 | 07/19/18  | 99             | Site Reconnaissance - Ledge                               |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| SITE1010                       | Erosion control, site fencing, trailers, signage, staging | 25                 | 07/06/18 | 08/10/18  | 0              | Erosion control, site fencing, trailers, signage, staging |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| SITE1020                       | Install Temporary Utilities                               | 20                 | 07/13/18 | 08/09/18  | 99             | Install Temporary Utilities                               |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| SITE1030                       | Site Layout & Benchmarks                                  | 5                  | 07/13/18 | 07/19/18  | 99             | Site Layout & Benchmarks                                  |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| SITE1065                       | Sheeting/Ledge Removal - Wall B2 if necessary             | 40                 | 07/20/18 | 09/14/18  | 99             | Sheeting/Ledge Removal - Wall B2 if necessary             |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| SITE1040                       | Construct Access Roads                                    | 15                 | 07/27/18 | 08/17/18  | 0              | Construct Access Roads                                    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| SITE1100                       | Install Retaining Wall B3                                 | 30                 | 07/27/18 | 09/10/18  | 104            | Install Retaining Wall B3                                 |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| SITE1080                       | Install new utility duct bank                             | 20                 | 07/30/18 | 08/27/18  | 113            | Install new utility duct bank                             |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| SITE1090                       | Construct New Entrance                                    | 20                 | 07/31/18 | 08/28/18  | 0              | Construct New Entrance                                    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| SITE2240                       | Construct new Parking - Ready for Start of School         | 20                 | 07/31/18 | 08/28/18* | 0              | Construct new Parking - Ready for Start of School         |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| SITE1050                       | Cut/Fill, Rough Grade Site                                | 40                 | 08/03/18 | 10/01/18  | 89             | Cut/Fill, Rough Grade Site                                |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| SITE1070                       | Site ready for Foundations                                | 0                  |          | 10/01/18  | 89             | Site ready for Foundations                                |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| Phase 1B - New Building        |   | 684                | 10/01/18 | 06/11/21  | -9             |   |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| Foundations                    |   | 213                | 10/01/18 | 08/05/19  | 38             |   |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| Foundations Core               |   | 183                | 10/01/18 | 06/21/19  | 36             |   |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| Retaining Wall B1              |   | 125                | 10/01/18 | 04/01/19  | 64             |   |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| RW1 1000                       | Excavate for Spread Footings - Wall B1                    | 40                 | 10/01/18 | 11/29/18  | 89             | Excavate for Spread Footings - Wall B1                    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| RW1 1010                       | Form and place spread footings - Wall B1                  | 40                 | 11/13/18 | 01/11/19  | 64             | Form and place spread footings - Wall B1                  |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| RW1 1040                       | Install Foundation Drainage B1                            | 25                 | 12/13/18 | 01/18/19  | 114            | Install Foundation Drainage B1                            |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| RW1 1020                       | Form and place retaining wall B1                          | 40                 | 12/20/18 | 02/15/19  | 64             | Form and place retaining wall B1                          |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| RW1 1050                       | Dampproof Wall B1   | 15                 | 02/11/19 | 03/04/19  | 64             | Dampproof Wall B1   |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| RW1 1030                       | Backfill Wall B1  | 25                 | 02/26/19 | 04/01/19  | 64             | Backfill Wall B1  |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| Foundations                    |   | 103                | 01/28/19 | 06/21/19  | 36             |   |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| FDC 1000                       | Excavate for Spread Footings Core                         | 40                 | 01/28/19 | 03/25/19  | 59             | Excavate for Spread Footings Core                         |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| FDC 1010                       | Form and place spread footings & Piers Core               | 40                 | 03/08/19 | 05/02/19  | 36             | Form and place spread footings & Piers Core               |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| FDC 1020                       | Install Elevator Pit, Foundation                          | 10                 | 03/12/19 | 03/25/19  | 69             | Install Elevator Pit, Foundation                          |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| FDC 1040                       | Form and place walls, piers Core                          | 40                 | 04/12/19 | 06/07/19  | 36             | Form and place walls, piers Core                          |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| FDC 1050                       | Install Foundation Drainage Core                          | 25                 | 04/19/19 | 05/23/19  | 51             | Install Foundation Drainage Core                          |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| FDC 1060                       | Backfill Foundations Core                                 | 30                 | 05/10/19 | 06/21/19  | 36             | Backfill Foundations Core                                 |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| Foundations Kitchen            |   | 70                 | 04/26/19 | 08/05/19  | 38             |   |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| Foundations                    |   | 50                 | 04/26/19 | 07/08/19  | 58             |   |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| FDK 1000                       | Excavate for Spread Footings Kitchen                      | 30                 | 04/26/19 | 06/07/19  | 38             | Excavate for Spread Footings Kitchen                      |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| FDK 1010                       | Form and place spread footings & Piers Kitchen            | 30                 | 05/03/19 | 06/14/19  | 58             | Form and place spread footings & Piers Kitchen            |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| FDK 1040                       | Form and place walls, piers Kitchen                       | 25                 | 05/24/19 | 06/28/19  | 58             | Form and place walls, piers Kitchen                       |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| FDK 1050                       | Install Foundation Drainage Kitchen                       | 25                 | 05/24/19 | 06/28/19  | 58             | Install Foundation Drainage Kitchen                       |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| FDK 1060                       | Backfill Foundations Kitchen                              | 25                 | 06/03/19 | 07/08/19  | 58             | Backfill Foundations Kitchen                              |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| Retaining Wall B2              |   | 60                 | 05/10/19 | 08/05/19  | 38             |   |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| RW2 1000                       | Excavate for Spread Footings - Wall B2                    | 25                 | 05/10/19 | 06/14/19  | 38             | Excavate for Spread Footings - Wall B2                    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| RW2 1010                       | Form and place spread footings - Wall B2                  | 25                 | 05/17/19 | 06/21/19  | 38             | Form and place spread footings - Wall B2                  |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| RW2 1020                       | Form and place retaining wall B2                          | 25                 | 06/03/19 | 07/08/19  | 38             | Form and place retaining wall B2                          |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| RW2 1030                       | Install Foundation Drainage B2                            | 20                 | 06/10/19 | 07/08/19  | 53             | Install Foundation Drainage B2                            |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |



| Activity ID         | Activity Name                          | Orig Dur<br>(Days)       | Start    | Finish   | Total<br>Float | Q4 | 2018 |    |    |    | 2019 |    |    |    | 2020 |    |    |    | 2021 |    |    |    | 2022 |    |    |    | 2023 |    |    |    | 2024 |    | Q3 |
|---------------------|--|--------------------------|----------|----------|----------------|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|
|                     |  |                          |          |          |                |    | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 |    |
|                     | KSTL 1070                              | Stand Columns            | 10       | 08/06/19 | 08/19/19       | 38 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|                     | KSTL 1080                              | Install Beams and Joists | 15       | 08/20/19 | 09/10/19       | 38 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|                     | KSTL 1090                              | Install Metal Decking    | 5        | 09/11/19 | 09/17/19       | 38 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|                     | KSTL 1100                              | Install Detailing        | 5        | 09/18/19 | 09/24/19       | 38 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Slabs & Stars       |  | 144                      | 07/17/19 | 02/10/20 | 119            |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Academic Wing A1    |  | 103                      | 07/17/19 | 12/11/19 | 160            |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Slab-on-Deck        |  | 28                       | 07/17/19 | 08/23/19 | 29             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A1SLB1030           | Install Temp stairs/staging for access | 5                        | 07/17/19 | 07/23/19 | 29             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A1SLB1000           | Prep and Place SOD 2nd Floor           | 8                        | 07/24/19 | 08/02/19 | 29             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A1SLB1010           | Prep and Place SOD 3rd Floor           | 8                        | 08/02/19 | 08/13/19 | 29             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A1SLB1020           | Prep and Place SOD Roof                | 8                        | 08/14/19 | 08/23/19 | 29             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Slab-on-Grade       |  | 55                       | 08/26/19 | 11/11/19 | 67             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A1SLB1040           | Install Under slab MEP and drainage    | 40                       | 08/26/19 | 10/21/19 | 67             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A1SLB1050           | Prep and Place SOG                     | 15                       | 10/22/19 | 11/11/19 | 67             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Stairs              |  | 75                       | 08/26/19 | 12/11/19 | 160            |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| ASLB1060            | Construct Stair CMU shafts             | 30                       | 08/26/19 | 10/07/19 | 160            |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| ASLB1070            | Install metal pan stairs               | 30                       | 10/08/19 | 11/18/19 | 160            |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| ASLB1080            | Place concrete stairs                  | 15                       | 11/19/19 | 12/11/19 | 160            |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Academic Wing A2    |  | 114                      | 08/02/19 | 01/15/20 | 39             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Slab-on-Deck        |  | 39                       | 08/02/19 | 09/26/19 | 29             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A2SLB 1020          | Install Temp stairs/staging for access | 5                        | 08/02/19 | 08/08/19 | 40             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A2SLB 1040          | Prep and Place SOD 2nd Floor           | 8                        | 08/26/19 | 09/05/19 | 29             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A2SLB 1050          | Prep and Place SOD 3rd Floor           | 8                        | 09/05/19 | 09/16/19 | 29             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A2SLB 1060          | Prep and Place SOD Roof                | 8                        | 09/17/19 | 09/26/19 | 29             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Slab-on-Grade       |  | 55                       | 09/27/19 | 12/16/19 | 59             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A2SLB 1070          | Install Under slab MEP and drainage    | 40                       | 09/27/19 | 11/25/19 | 59             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A2SLB 1080          | Prep and Place SOG                     | 15                       | 11/26/19 | 12/16/19 | 59             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Stairs              |  | 75                       | 09/27/19 | 01/15/20 | 29             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A2SLB 1030          | Construct Stair CMU shafts             | 30                       | 09/27/19 | 11/07/19 | 29             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A2SLB 1000          | Install metal pan stairs               | 30                       | 11/08/19 | 12/23/19 | 29             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A2SLB 1010          | Place concrete stairs                  | 15                       | 12/24/19 | 01/15/20 | 29             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Academic Wing A3    |  | 96                       | 09/06/19 | 01/23/20 | 127            |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Slab-on-Deck        |  | 23                       | 09/27/19 | 10/29/19 | 51             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A3SLB 1040          | Prep and Place SOD 2nd Floor           | 8                        | 09/27/19 | 10/08/19 | 51             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A3SLB 1050          | Prep and Place SOD 3rd Floor           | 8                        | 10/08/19 | 10/17/19 | 51             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A3SLB 1060          | Prep and Place SOD Roof                | 8                        | 10/18/19 | 10/29/19 | 51             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Slab-on-Grade       |  | 55                       | 10/30/19 | 01/20/20 | 51             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A3SLB 1070          | Install Under slab MEP and drainage    | 40                       | 10/30/19 | 12/27/19 | 51             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A3SLB 1080          | Prep and Place SOG                     | 15                       | 12/30/19 | 01/20/20 | 51             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Stairs              |  | 96                       | 09/06/19 | 01/23/20 | 127            |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A3SLB 1030          | Construct CMU Stair & Elevator shafts  | 30                       | 09/06/19 | 10/18/19 | 193            |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A3SLB 1000          | Install metal pan stairs               | 30                       | 11/18/19 | 01/02/20 | 38             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| A3SLB 1010          | Place concrete stairs                  | 15                       | 01/03/20 | 01/23/20 | 38             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Kitchen, Caf, Media |  | 80                       | 10/16/19 | 02/10/20 | 41             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Slab-on-Deck        |  | 10                       | 10/16/19 | 10/29/19 | 56             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| KSLB1020            | Prep and Place SOD Second Floor        | 5                        | 10/16/19 | 10/22/19 | 36             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| KSLB1010            | Prep and Place SOD Roof                | 5                        | 10/23/19 | 10/29/19 | 56             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Slab-on-Grade       |  | 55                       | 10/30/19 | 01/20/20 | 56             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| KSLB1030            | Install Under slab MEP and drainage    | 40                       | 10/30/19 | 12/27/19 | 56             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| KSLB1040            | Prep and Place SOG - First Floor       | 15                       | 12/30/19 | 01/20/20 | 56             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
| Stairs              |  | 75                       | 10/23/19 | 02/10/20 | 36             |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |



| Activity ID |                                     | Activity Name                                      | Orig Dur<br>(Days)                             | Start    | Finish   | Total<br>Float | 2018 |    |    |    | 2019 |    |    |    | 2020 |    |    |    | 2021 |    |    |    | 2022 |    |    |    | 2023 |    |    |    | 2024 |    | 33 |
|-------------|-------------------------------------|--|--|----------|----------|----------------|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|
| Q4          |                                     |  |  |          |          |                | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 |    |
|             |                                     | KSLB1050   | Construct Stair CMU shafts                     | 30       | 10/23/19 | 12/05/19       | 36   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | KSLB1060   | Install metal pan stairs                       | 30       | 12/06/19 | 01/20/20       | 36   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | KSLB1070   | Place concrete stairs                          | 15       | 01/21/20 | 02/10/20       | 36   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | Core   |  | 91       | 09/25/19 | 02/04/20       | 50   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | Slab-on-Deck                                       |  | 16       | 09/25/19 | 10/16/19       | 50   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | CSLAB 2035   | Prep and Place SOD First Floor                 | 8        | 09/25/19 | 10/04/19       | 38   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | CSLAB 2100   | Prep and Place SOD Roof                        | 8        | 10/07/19 | 10/16/19       | 50   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | Slab-on-Grade                                      |  | 75       | 10/17/19 | 02/04/20       | 50   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | CSLAB 2000   | Install Under slab MEP and drainage            | 60       | 10/17/19 | 01/14/20       | 50   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | CSLAB 2020   | Prep and Place SOG - Ground Floor              | 15       | 01/15/20 | 02/04/20       | 50   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | Stairs   |  | 53       | 10/07/19 | 12/20/19       | 80   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | CSLAB 2080   | Construct Stair & elevator CMU shafts          | 30       | 10/07/19 | 11/15/19       | 38   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | CSLAB 2040   | Install metal pan stairs                       | 30       | 10/17/19 | 11/29/19       | 80   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | CSLAB 2060   | Place concrete stairs                          | 15       | 12/02/19 | 12/20/19       | 80   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | Roofing  |  | 107      | 08/26/19 | 01/29/20       | 244  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | Roofing and Roof Mounted Items Academics Wng A1    |  | 35       | 08/26/19 | 10/15/19       | 200  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A1ROO1000  | Install roof blocking and mechanical curbs     | 15       | 08/26/19 | 09/16/19       | 92   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A1ROO1010  | Apply Spray, Intumescent Fireproofing          | 15       | 08/26/19 | 09/16/19       | 161  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A1ROO1020  | Install roofing system                         | 15       | 09/03/19 | 09/23/19       | 92   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A1ROO1030  | Install Roof Leaders                           | 10       | 09/10/19 | 09/23/19       | 92   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A1ROO1040  | Install rooftop HVAC units and other equipment | 15       | 09/24/19 | 10/14/19       | 200  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A1ROO1050  | Roofing work complete                          | 0        | 10/15/19 | 10/15/19       | 200  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | Roofing and Roof Mounted Items Academic Wng A2     |  | 35       | 09/17/19 | 11/05/19       | 185  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A2ROO1000  | Install roof blocking and mechanical curbs     | 15       | 09/17/19 | 10/07/19       | 92   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A2ROO1010  | Apply Spray, Intumescent Fireproofing          | 15       | 09/17/19 | 10/07/19       | 205  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A2ROO1020  | Install roofing system                         | 15       | 09/24/19 | 10/14/19       | 92   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A2ROO1030  | Install Roof Leaders                           | 10       | 10/01/19 | 10/14/19       | 92   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A2ROO1040  | Install rooftop HVAC units and other equipment | 15       | 10/15/19 | 11/04/19       | 185  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A2ROO1050  | Roofing work complete                          | 0        | 11/05/19 | 11/05/19       | 185  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | Roofing and Roof Mounted Items Academic Wng A3     |  | 35       | 10/08/19 | 11/28/19       | 170  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A3ROO1000  | Install roof blocking and mechanical curbs     | 15       | 10/08/19 | 10/28/19       | 92   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A3ROO1010  | Apply Spray, Intumescent Fireproofing          | 15       | 10/08/19 | 10/28/19       | 190  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A3ROO1020  | Install roofing system                         | 15       | 10/15/19 | 11/04/19       | 92   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A3ROO1030  | Install Roof Leaders                           | 10       | 10/22/19 | 11/04/19       | 92   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A3ROO1040  | Install rooftop HVAC units and other equipment | 15       | 11/05/19 | 11/27/19       | 170  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | A3ROO1050  | Roofing work complete                          | 0        | 11/28/19 | 11/28/19       | 170  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | Roofing and Roof Mounted Items Media, Kitchen, Caf |  | 40       | 10/30/19 | 12/30/19       | 162  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | KROOF 1010   | Install roof blocking and mechanical curbs     | 20       | 10/30/19 | 11/28/19       | 89   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | KROOF 1000   | Install roofing system                         | 20       | 11/20/19 | 12/19/19       | 153  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             |                                     | KROOF 1020   | Install rooftop HVAC units and other equipment | 20       | 11/29/19 | 12/27/19       | 162  |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             | KRTL 1060                           | Apply Spray, Intumescent Fireproofing              | 15   | 11/29/19 | 12/19/19 | 89             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             | KROOF 1050                          | Install Roof Leaders                               | 15   | 11/29/19 | 12/19/19 | 153            |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             | KROOF 1030                          | Roofing work complete                              | 0  | 12/30/19 | 12/30/19 | 162            |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             | Roofing and Roof Mounted Items Core |  | 70   | 10/17/19 | 01/29/20 | 244            |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             | CROOF 1010                          | Install roof blocking and mechanical curbs         | 40   | 10/17/19 | 12/13/19 | 80             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             | CROOF 1000                          | Install roofing system                             | 40   | 10/24/19 | 12/20/19 | 80             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             | CROOF 1050                          | Install Roof Leaders                               | 30   | 11/07/19 | 12/20/19 | 80             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             | CROOF 1020                          | Install rooftop HVAC units and other equipment     | 30   | 12/16/19 | 01/28/20 | 154            |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             | CRTL 1060                           | Apply Spray, Intumescent Fireproofing              | 5  | 12/16/19 | 12/20/19 | 269            |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             | CROOF 1030                          | Roofing work complete                              | 0  | 01/29/20 | 01/29/20 | 244            |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |
|             | Envelope                            |  | 122  | 08/14/19 | 02/07/20 | 237            |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |









| DETAIL SCHEDULE      |                                      |  |                       |          |             | Project Controls SCHEDULE            |  |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    | Appendix                  |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Activity ID          | Activity Name                        | Orig Dur (Days)                            | Start                 | Finish   | Total Float | 2018                                 |  |    |                      | 2019 |    |                    |    | 2020 |         |    |    | 2021                    |    |    |             | 2022 |    |                  |    | 2023 |                |    |    | 2024                      |    | 3 |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      |                                      |  |                       |          |             | Q1                                   | Q2   | Q3 | Q4                   | Q1   | Q2 | Q3                 | Q4 | Q1   | Q2      | Q3 | Q4 | Q1                      | Q2 | Q3 | Q4          | Q1   | Q2 | Q3               | Q4 | Q1   | Q2             | Q3 | Q4 | Q1                        | Q2 |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B3F 1280                             | Epoxy Floor Prep & Finish                  | 5                     | 06/25/20 | 07/01/20    | 65                                   | Epoxy Floor Prep & Finish                  |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B3F 1180                             | Acoustical ceilings finish                 | 15                    | 07/01/20 | 07/22/20    | 55                                   | Acoustical ceilings finish                 |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B3F 1170                             | Toilet plumbing fixtures                   | 10                    | 07/02/20 | 07/16/20    | 65                                   | Toilet plumbing fixtures                   |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B3F 1200                             | Fire Alarm devices and finishes            | 8                     | 07/23/20 | 08/03/20    | 68                                   | Fire Alarm devices and finishes            |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B3F 1190                             | Finish painting/acoustical wall panels     | 15                    | 07/24/20 | 08/13/20    | 49                                   | Finish painting/acoustical wall panels     |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B3F 1240                             | Misc. Division 10, 11, and 12              | 15                    | 08/10/20 | 08/28/20    | 49                                   | Misc. Division 10, 11, and 12              |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B3F 1220                             | ATC finishes                               | 5                     | 08/14/20 | 08/20/20    | 55                                   | ATC finishes                               |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B3F 1230                             | Electrical finishes and trim-out           | 5                     | 08/14/20 | 08/20/20    | 55                                   | Electrical finishes and trim-out           |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B3F 1290                             | Interior Signage                           | 10                    | 08/14/20 | 08/27/20    | 50                                   | Interior Signage                           |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B3F 1250                             | Clean-up and work list                     | 20                    | 08/31/20 | 09/28/20    | 49                                   | Clean-up and work list                     |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B3F 1260                             | Complete Finishes - Third Floor            | 0                     |          | 09/28/20    | 49                                   | Complete Finishes - Third Floor            |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | Second Floor Finishes                |  |                       | 120      | 04/16/20    | 10/05/20                             | 49   |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1000                             | Start Finishes - Second Floor              | 0                     | 04/16/20 |             | 49                                   | Start Finishes - Second Floor              |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1010                             | Building Insulation                        | 10                    | 04/16/20 | 04/29/20    | 53                                   | Building Insulation                        |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1020                             | Plumbing Insulation                        | 10                    | 04/16/20 | 04/29/20    | 53                                   | Plumbing Insulation                        |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1030                             | HVAC Insulation                            | 15                    | 04/16/20 | 05/06/20    | 49                                   | HVAC Insulation                            |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1040                             | HVAC terminal equipment                    | 20                    | 04/16/20 | 05/13/20    | 72                                   | HVAC terminal equipment                    |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1050                             | Hang Drywall                               | 20                    | 05/06/20 | 06/03/20    | 49                                   | Hang Drywall                               |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1060                             | Drywall Tape and Finish                    | 20                    | 05/13/20 | 06/10/20    | 49                                   | Drywall Tape and Finish                    |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1070                             | Painting - prime and one finish coat       | 15                    | 05/28/20 | 06/17/20    | 49                                   | Painting - prime and one finish coat       |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1080                             | Acoustical ceiling grid                    | 15                    | 06/09/20 | 06/29/20    | 55                                   | Acoustical ceiling grid                    |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1140                             | Millwork and casework                      | 20                    | 06/11/20 | 07/09/20    | 54                                   | Millwork and casework                      |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1090                             | Light fixtures                             | 15                    | 06/16/20 | 07/07/20    | 64                                   | Light fixtures                             |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1100                             | Interior storefronts/glass and glazing     | 8                     | 06/18/20 | 06/29/20    | 51                                   | Interior storefronts/glass and glazing     |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1110                             | Doors and hardware                         | 10                    | 06/18/20 | 07/01/20    | 49                                   | Doors and hardware                         |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1120                             | Install wall tile                          | 10                    | 06/18/20 | 07/01/20    | 65                                   | Install wall tile                          |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1130                             | Sprinkler drops and heads                  | 10                    | 06/18/20 | 07/01/20    | 55                                   | Sprinkler drops and heads                  |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1270                             | Glass & Glazing                            | 8                     | 06/18/20 | 06/29/20    | 97                                   | Glass & Glazing                            |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1150                             | HVAC drops/RGD's                           | 10                    | 06/30/20 | 07/14/20    | 87                                   | HVAC drops/RGD's                           |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1160                             | Sprinkler pipe test                        | 4                     | 07/02/20 | 07/08/20    | 55                                   | Sprinkler pipe test                        |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1210                             | Floor prep & finishes (Resilient & Carpet) | 25                    | 07/02/20 | 08/06/20    | 49                                   | Floor prep & finishes (Resilient & Carpet) |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1280                             | Epoxy Floor Prep & Finish                  | 5                     | 07/02/20 | 07/09/20    | 65                                   | Epoxy Floor Prep & Finish                  |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1180                             | Acoustical ceilings finish                 | 15                    | 07/09/20 | 07/29/20    | 55                                   | Acoustical ceilings finish                 |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1170                             | Toilet plumbing fixtures                   | 10                    | 07/10/20 | 07/23/20    | 65                                   | Toilet plumbing fixtures                   |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1200                             | Fire Alarm devices and finishes            | 8                     | 07/30/20 | 08/10/20    | 68                                   | Fire Alarm devices and finishes            |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1190                             | Finish painting/acoustical wall panels     | 15                    | 07/31/20 | 08/20/20    | 49                                   | Finish painting/acoustical wall panels     |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1240                             | Misc. Division 10, 11, and 12              | 15                    | 08/17/20 | 09/04/20    | 49                                   | Misc. Division 10, 11, and 12              |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1220                             | ATC finishes                               | 5                     | 08/21/20 | 08/27/20    | 55                                   | ATC finishes                               |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1230                             | Electrical finishes and trim-out           | 5                     | 08/21/20 | 08/27/20    | 55                                   | Electrical finishes and trim-out           |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1290                             | Interior Signage                           | 10                    | 08/21/20 | 09/03/20    | 50                                   | Interior Signage                           |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1250                             | Clean-up and work list                     | 20                    | 09/08/20 | 10/05/20    | 49                                   | Clean-up and work list                     |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | B2F 1260                             | Complete Finishes - Second Floor           | 0                     |          | 10/05/20    | 49                                   | Complete Finishes - Second Floor           |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      | First Floor Finishes                 |  |                       | 120      | 04/23/20    | 10/12/20                             | 49   |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| B1F 1000             | Start Finishes - First Floor         | 0  | 04/23/20              |          | 49          | Start Finishes - First Floor         |  |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| B1F 1010             | Building Insulation                  | 10   | 04/23/20              | 05/06/20 | 53          | Building Insulation                  |  |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| B1F 1020             | Plumbing Insulation                  | 10   | 04/23/20              | 05/06/20 | 53          | Plumbing Insulation                  |  |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| B1F 1030             | HVAC Insulation                      | 15   | 04/23/20              | 05/13/20 | 49          | HVAC Insulation                      |  |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| B1F 1040             | HVAC terminal equipment              | 20   | 04/23/20              | 05/20/20 | 72          | HVAC terminal equipment              |  |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| B1F 1050             | Hang Drywall                         | 20   | 05/13/20              | 06/10/20 | 49          | Hang Drywall                         |  |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| B1F 1060             | Drywall Tape and Finish              | 20   | 05/20/20              | 06/17/20 | 49          | Drywall Tape and Finish              |  |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| B1F 1070             | Painting - prime and one finish coat | 15   | 06/04/20              | 06/24/20 | 49          | Painting - prime and one finish coat |  |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Start Date: 11/03/17 |                                      |  | Finish Date: 08/26/22 |          |             | Data Date: 11/03/17                  |  |    | Print Date: 10/19/17 |      |    | Layout: WSH Review |    |      | Summary |    |    | Critical Remaining Work |    |    | Actual Work |      |    | Actual Milestone |    |      | Remaining Work |    |    | Remaining Level of Effort |    |   | Critical Milestone |  |  | Worcester South High Community School |  |  | Note: The projections are based upon activity earning type and performance to-date on in-progress activities. Every precaution has been taken to ensure this report is accurate and up-to-date. No liability is assumed for errors or omissions. Rounding errors may exist. |  |  | FONTAINE BROS., INC.<br>CONSTRUCTION MANAGERS<br>GENERAL CONTRACTORS |  |  | W.T. RICH CO., INC. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                      |                                      |  |                       |          |             |                                      |  |    |                      |      |    |                    |    |      |         |    |    |                         |    |    |             |      |    |                  |    |      |                |    |    |                           |    |   |                    |  |  |                                       |  |  |   |  |  |  |  |  |                     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |



| Activity ID           |  | Activity Name                              | Orig Dur<br>(Days) | Start    | Finish   | Total<br>Float | 2018201920202021202220232024                         |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------|--|--|--------------------|----------|----------|----------------|--|-----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
|                       |  |  |                    |          |          |                | Q1Q2Q3Q4Q1Q2Q3Q4Q1Q2Q3Q4Q1Q2Q3Q4Q1Q2Q3Q4Q1Q2Q3Q4Q1Q2 |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1080   | Acoustical ceiling grid                    | 15                 | 06/16/20 | 07/07/20 | 55             | Acoustical ceiling grid                              |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1140   | Millwork and casework                      | 20                 | 06/18/20 | 07/16/20 | 54             | Millwork and casework                                |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1090   | Light fixtures                             | 15                 | 06/23/20 | 07/14/20 | 64             | Light fixtures                                       |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1100   | Interior storefronts/glass and glazing     | 8                  | 06/25/20 | 07/07/20 | 51             | Interior storefronts/glass and glazing               |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1110   | Doors and hardware                         | 10                 | 06/25/20 | 07/09/20 | 49             | Doors and hardware                                   |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1120   | Install wall tile                          | 10                 | 06/25/20 | 07/09/20 | 65             | Install wall tile                                    |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1130   | Sprinkler drops and heads                  | 10                 | 06/25/20 | 07/09/20 | 55             | Sprinkler drops and heads                            |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1270   | Glass & Glazing                            | 8                  | 06/25/20 | 07/07/20 | 97             | Glass & Glazing                                      |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1150   | HVAC drops/RGD's                           | 10                 | 07/08/20 | 07/21/20 | 87             | HVAC drops/RGD's                                     |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1160   | Sprinkler pipe test                        | 4                  | 07/10/20 | 07/15/20 | 55             | Sprinkler pipe test                                  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1210   | Floor prep & finishes (Resilient & Carpet) | 25                 | 07/10/20 | 08/13/20 | 49             | Floor prep & finishes (Resilient & Carpet)           |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1280   | Epoxy Floor Prep & Finish                  | 5                  | 07/10/20 | 07/16/20 | 65             | Epoxy Floor Prep & Finish                            |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1180   | Acoustical ceilings finish                 | 15                 | 07/16/20 | 08/05/20 | 55             | Acoustical ceilings finish                           |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1170   | Toilet plumbing fixtures                   | 10                 | 07/17/20 | 07/30/20 | 65             | Toilet plumbing fixtures                             |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1200   | Fire Alarm devices and finishes            | 8                  | 08/06/20 | 08/17/20 | 68             | Fire Alarm devices and finishes                      |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1190   | Finish painting/acoustical wall panels     | 15                 | 08/07/20 | 08/27/20 | 49             | Finish painting/acoustical wall panels               |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1240   | Misc. Division 10, 11, and 12              | 15                 | 08/24/20 | 09/14/20 | 49             | Misc. Division 10, 11, and 12                        |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1220   | ATC finishes                               | 5                  | 08/28/20 | 09/03/20 | 55             | ATC finishes   |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1230   | Electrical finishes and trim-out           | 5                  | 08/28/20 | 09/03/20 | 55             | Electrical finishes and trim-out                     |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1290   | Interior Signage                           | 10                 | 08/28/20 | 09/11/20 | 50             | Interior Signage                                     |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1250   | Clean-up and work list                     | 20                 | 09/15/20 | 10/12/20 | 49             | Clean-up and work list                               |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | B1F 1260   | Complete Finishes - First Floor            | 0                  |          | 10/12/20 | 49             | Complete Finishes - First Floor                      |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | Wing 3   |  |                    | 189      | 02/06/20 | 11/02/20       | 49   |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | Third Floor Rough-in                               |  |                    | 60       | 02/06/20 | 04/30/20       | 49   |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|                       | C3R 1000   | Start Rough-in Work - Third Floor          |                    | 0        | 02/06/20 |                | 29   | Start Rough-in Work - Third Floor |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C3R 1010              | Rough-in HVAC duct work                            |  | 20                 | 02/06/20 | 03/05/20 | 49             | Rough-in HVAC duct work                              |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C3R 1020              | Frame interior partitions w/door frames & blocking |  | 20                 | 02/06/20 | 03/05/20 | 49             | Frame interior partitions w/door frames & blocking   |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C3R 1030              | Rough-in plumbing                                  |  | 15                 | 02/06/20 | 02/27/20 | 64             | Rough-in plumbing                                    |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C3R 1040              | Rough-in HVAC piping                               |  | 15                 | 02/21/20 | 03/12/20 | 54             | Rough-in HVAC piping                                 |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C3R 1050              | Rough-in sprinkler                                 |  | 15                 | 02/28/20 | 03/19/20 | 49             | Rough-in sprinkler                                   |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C3R 1060              | Rough-in electrical power, lighting                |  | 20                 | 03/06/20 | 04/02/20 | 49             | Rough-in electrical power, lighting                  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C3R 1080              | Rough-in fire alarm                                |  | 20                 | 03/20/20 | 04/16/20 | 49             | Rough-in fire alarm                                  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C3R 1090              | Rough-in tel-data/security/PV                      |  | 20                 | 03/20/20 | 04/16/20 | 49             | Rough-in tel-data/security/PV                        |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C3R 1070              | Rough-in ATC controls                              |  | 15                 | 03/27/20 | 04/16/20 | 49             | Rough-in ATC controls                                |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C3R 1100              | MEP Inspections                                    |  | 10                 | 04/17/20 | 04/30/20 | 49             | MEP Inspections                                      |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C3R 1110              | Complete Rough-in Third Floor                      |  | 0                  |          | 04/30/20 | 49             | Complete Rough-in Third Floor                        |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Second Floor Rough-in |  |  | 60                 | 02/13/20 | 05/07/20 | 49             |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C2R 1000              | Start Rough-in Work - Second Floor                 |  | 0                  | 02/13/20 |          | 29             | Start Rough-in Work - Second Floor                   |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C2R 1010              | Rough-in HVAC duct work                            |  | 20                 | 02/13/20 | 03/12/20 | 49             | Rough-in HVAC duct work                              |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C2R 1020              | Frame interior partitions w/door frames & blocking |  | 20                 | 02/13/20 | 03/12/20 | 49             | Frame interior partitions w/door frames & blocking   |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C2R 1030              | Rough-in plumbing                                  |  | 15                 | 02/13/20 | 03/05/20 | 64             | Rough-in plumbing                                    |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C2R 1040              | Rough-in HVAC piping                               |  | 15                 | 02/28/20 | 03/19/20 | 54             | Rough-in HVAC piping                                 |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C2R 1050              | Rough-in sprinkler                                 |  | 15                 | 03/06/20 | 03/26/20 | 49             | Rough-in sprinkler                                   |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C2R 1060              | Rough-in electrical power, lighting                |  | 20                 | 03/13/20 | 04/09/20 | 49             | Rough-in electrical power, lighting                  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C2R 1080              | Rough-in fire alarm                                |  | 20                 | 03/27/20 | 04/23/20 | 49             | Rough-in fire alarm                                  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C2R 1090              | Rough-in tel-data/security/PV                      |  | 20                 | 03/27/20 | 04/23/20 | 49             | Rough-in tel-data/security/PV                        |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C2R 1070              | Rough-in ATC controls                              |  | 15                 | 04/03/20 | 04/23/20 | 49             | Rough-in ATC controls                                |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C2R 1100              | MEP Inspections                                    |  | 10                 | 04/24/20 | 05/07/20 | 49             | MEP Inspections                                      |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C2R 1110              | Complete Rough-in Second Floor                     |  | 0                  |          | 05/07/20 | 49             | Complete Rough-in Second Floor                       |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| First Floor Rough-in  |  |  | 60                 | 02/21/20 | 05/14/20 | 49             |  |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C1R 1000              | Start Rough-in Work - First Floor                  |  | 0                  | 02/21/20 |          | 29             | Start Rough-in Work - First Floor                    |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |



| Activity ID | Activity Name        | Orig Dur<br>(Days)                         | Start | Finish   | Total<br>Float |    | 2018 |    |    |    | 2019 |    |    |    | 2020 |    |    |    | 2021 |    |    |    | 2022 |    |    |    | 2023 |    |    |    | 2024 |    |  |
|-------------|----------------------|--|-------|----------|----------------|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|--|
|             |                      |  |       |          |                |    | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 |  |
|             | C2F 1080             | Acoustical ceiling grid                    | 15    | 06/30/20 | 07/21/20       | 55 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1140             | Millwork and casework                      | 20    | 07/02/20 | 07/30/20       | 54 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1090             | Light fixtures                             | 15    | 07/08/20 | 07/28/20       | 64 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1100             | Interior storefronts/glass and glazing     | 8     | 07/10/20 | 07/21/20       | 51 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1110             | Doors and hardware                         | 10    | 07/10/20 | 07/23/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1120             | Install wall tile                          | 10    | 07/10/20 | 07/23/20       | 65 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1130             | Sprinkler drops and heads                  | 10    | 07/10/20 | 07/23/20       | 55 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1270             | Glass & Glazing                            | 8     | 07/10/20 | 07/21/20       | 97 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1150             | HVAC drops/RGD's                           | 10    | 07/22/20 | 08/04/20       | 87 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1160             | Sprinkler pipe test                        | 4     | 07/24/20 | 07/29/20       | 55 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1210             | Floor prep & finishes (Resilient & Carpet) | 25    | 07/24/20 | 08/27/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1280             | Epoxy Floor Prep & Finish                  | 5     | 07/24/20 | 07/30/20       | 65 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1180             | Acoustical ceilings finish                 | 15    | 07/30/20 | 08/19/20       | 55 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1170             | Toilet plumbing fixtures                   | 10    | 07/31/20 | 08/13/20       | 65 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1200             | Fire Alarm devices and finishes            | 8     | 08/20/20 | 08/31/20       | 68 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1190             | Finish painting/acoustical wall panels     | 15    | 08/21/20 | 09/11/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1240             | Misc. Division 10, 11, and 12              | 15    | 09/08/20 | 09/28/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1220             | ATC finishes                               | 5     | 09/14/20 | 09/18/20       | 55 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1230             | Electrical finishes and trim-out           | 5     | 09/14/20 | 09/18/20       | 55 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1290             | Interior Signage                           | 10    | 09/14/20 | 09/25/20       | 50 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1250             | Clean-up and work list                     | 20    | 09/29/20 | 10/26/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C2F 1260             | Complete Finishes - Second Floor           | 0     |          | 10/26/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | First Floor Finishes |  | 120   | 05/14/20 | 11/02/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1000             | Start Finishes - First Floor               | 0     | 05/14/20 |                | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1010             | Building Insulation                        | 10    | 05/14/20 | 05/28/20       | 53 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1020             | Plumbing Insulation                        | 10    | 05/14/20 | 05/28/20       | 53 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1030             | HVAC Insulation                            | 15    | 05/14/20 | 06/04/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1040             | HVAC terminal equipment                    | 20    | 05/14/20 | 06/11/20       | 72 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1050             | Hang Drywall                               | 20    | 06/04/20 | 07/01/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1060             | Drywall Tape and Finish                    | 20    | 06/11/20 | 07/09/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1070             | Painting - prime and one finish coat       | 15    | 06/25/20 | 07/16/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1080             | Acoustical ceiling grid                    | 15    | 07/08/20 | 07/28/20       | 55 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1140             | Millwork and casework                      | 20    | 07/10/20 | 08/06/20       | 54 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1090             | Light fixtures                             | 15    | 07/15/20 | 08/04/20       | 64 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1100             | Interior storefronts/glass and glazing     | 8     | 07/17/20 | 07/28/20       | 51 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1110             | Doors and hardware                         | 10    | 07/17/20 | 07/30/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1120             | Install wall tile                          | 10    | 07/17/20 | 07/30/20       | 65 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1130             | Sprinkler drops and heads                  | 10    | 07/17/20 | 07/30/20       | 55 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1270             | Glass & Glazing                            | 8     | 07/17/20 | 07/28/20       | 97 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1150             | HVAC drops/RGD's                           | 10    | 07/29/20 | 08/11/20       | 87 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1160             | Sprinkler pipe test                        | 4     | 07/31/20 | 08/05/20       | 55 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1210             | Floor prep & finishes (Resilient & Carpet) | 25    | 07/31/20 | 09/03/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1280             | Epoxy Floor Prep & Finish                  | 5     | 07/31/20 | 08/06/20       | 65 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1180             | Acoustical ceilings finish                 | 15    | 08/06/20 | 08/26/20       | 55 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1170             | Toilet plumbing fixtures                   | 10    | 08/07/20 | 08/20/20       | 65 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1200             | Fire Alarm devices and finishes            | 8     | 08/27/20 | 09/08/20       | 68 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1190             | Finish painting/acoustical wall panels     | 15    | 08/28/20 | 09/18/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1240             | Misc. Division 10, 11, and 12              | 15    | 09/15/20 | 10/05/20       | 49 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1220             | ATC finishes                               | 5     | 09/21/20 | 09/25/20       | 55 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1230             | Electrical finishes and trim-out           | 5     | 09/21/20 | 09/25/20       | 55 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | C1F 1290             | Interior Signage                           | 10    | 09/21/20 | 10/02/20       | 50 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |



| Activity ID                   | Activity Name                                      | Orig Dur<br>(Days) | Start    | Finish   | Total<br>Float | 2018   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 2019 |    |    |    | 2020 |    |    |    | 2021 |    |    |    | 2022 |    |    |    | 2023 |  |  |  | 2024 |  |
|-------------------------------|--|--------------------|----------|----------|----------------|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|--|--|--|------|--|
|                               |  |                    |          |          |                | Q1   | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 |      |  |  |  |      |  |
| C1F 1250                      | Clean-up and work list                             | 20                 | 10/06/20 | 11/02/20 | 49             | Clean-up and work list                             |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| C1F 1260                      | Complete Finishes - First Floor                    | 0                  |          | 11/02/20 | 49             | Complete Finishes - First Floor                    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| Caf/Kitchen, Media            |  | 187                | 02/21/20 | 11/12/20 | 42             |  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| Second Floor                  |  | 184                | 02/21/20 | 11/09/20 | 44             |  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| Media, Guidance, Art Rough-in |  | 65                 | 02/21/20 | 05/21/20 | 44             |  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2R 1000                      | Start Rough-in Work - Second Floor                 | 0                  | 02/21/20 |          | 29             | Start Rough-in Work - Second Floor                 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2R 1010                      | Rough-in HVAC duct work                            | 20                 | 02/21/20 | 03/19/20 | 44             | Rough-in HVAC duct work                            |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2R 1020                      | Frame interior partitions w/door frames & blocking | 20                 | 02/21/20 | 03/19/20 | 44             | Frame interior partitions w/door frames & blocking |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2R 1030                      | Rough-in plumbing                                  | 20                 | 02/21/20 | 03/19/20 | 59             | Rough-in plumbing                                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2R 1040                      | Rough-in HVAC piping                               | 20                 | 03/06/20 | 04/02/20 | 44             | Rough-in HVAC piping                               |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2R 1050                      | Rough-in sprinkler                                 | 15                 | 03/13/20 | 04/02/20 | 49             | Rough-in sprinkler                                 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2R 1060                      | Rough-in electrical power, lighting                | 20                 | 03/20/20 | 04/16/20 | 44             | Rough-in electrical power, lighting                |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2R 1070                      | Rough-in ATC controls                              | 15                 | 04/10/20 | 04/30/20 | 49             | Rough-in ATC controls                              |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2R 1080                      | Rough-in fire alarm                                | 20                 | 04/10/20 | 05/07/20 | 44             | Rough-in fire alarm                                |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2R 1090                      | Rough-in tel-data/security/PV                      | 20                 | 04/10/20 | 05/07/20 | 44             | Rough-in tel-data/security/PV                      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2R 1100                      | MEP Inspections                                    | 10                 | 05/08/20 | 05/21/20 | 44             | MEP Inspections                                    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2R 1110                      | Complete Rough-in Second Floor                     | 0                  |          | 05/21/20 | 44             | Complete Rough-in Second Floor                     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| Media, Guidance, Art Finishes |  | 120                | 05/21/20 | 11/09/20 | 44             |  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1000                      | Start Finishes - Second Floor                      | 0                  | 05/21/20 |          | 44             | Start Finishes - Second Floor                      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1010                      | Building Insulation                                | 10                 | 05/21/20 | 06/04/20 | 48             | Building Insulation                                |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1020                      | Plumbing Insulation                                | 10                 | 05/21/20 | 06/04/20 | 48             | Plumbing Insulation                                |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1030                      | HVAC Insulation                                    | 15                 | 05/21/20 | 06/11/20 | 44             | HVAC Insulation                                    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1040                      | HVAC terminal equipment                            | 20                 | 05/21/20 | 06/18/20 | 67             | HVAC terminal equipment                            |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1050                      | Hang Drywall                                       | 20                 | 06/11/20 | 07/09/20 | 44             | Hang Drywall                                       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1060                      | Drywall Tape and Finish                            | 20                 | 06/18/20 | 07/16/20 | 44             | Drywall Tape and Finish                            |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1070                      | Painting - prime and one finish coat               | 15                 | 07/02/20 | 07/23/20 | 44             | Painting - prime and one finish coat               |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1080                      | Acoustical ceiling grid                            | 15                 | 07/15/20 | 08/04/20 | 50             | Acoustical ceiling grid                            |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1140                      | Millwork and casework                              | 20                 | 07/17/20 | 08/13/20 | 49             | Millwork and casework                              |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1090                      | Light fixtures                                     | 15                 | 07/22/20 | 08/11/20 | 59             | Light fixtures                                     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1100                      | Interior storefronts/glass and glazing             | 8                  | 07/24/20 | 08/04/20 | 46             | Interior storefronts/glass and glazing             |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1110                      | Doors and hardware                                 | 10                 | 07/24/20 | 08/06/20 | 44             | Doors and hardware                                 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1120                      | Install wall tile                                  | 10                 | 07/24/20 | 08/06/20 | 60             | Install wall tile                                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1130                      | Sprinkler drops and heads                          | 10                 | 07/24/20 | 08/06/20 | 50             | Sprinkler drops and heads                          |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1270                      | Glass & Glazing                                    | 8                  | 07/24/20 | 08/04/20 | 92             | Glass & Glazing                                    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1150                      | HVAC drops/RGD's                                   | 10                 | 08/05/20 | 08/18/20 | 82             | HVAC drops/RGD's                                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1160                      | Sprinkler pipe test                                | 4                  | 08/07/20 | 08/12/20 | 50             | Sprinkler pipe test                                |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1210                      | Floor prep & finishes (Reslient & Carpet)          | 25                 | 08/07/20 | 09/11/20 | 44             | Floor prep & finishes (Reslient & Carpet)          |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1280                      | Epoxy Floor Prep & Finish                          | 5                  | 08/07/20 | 08/13/20 | 60             | Epoxy Floor Prep & Finish                          |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1180                      | Acoustical ceilings finish                         | 15                 | 08/13/20 | 09/02/20 | 50             | Acoustical ceilings finish                         |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1170                      | Toilet plumbing fixtures                           | 10                 | 08/14/20 | 08/27/20 | 60             | Toilet plumbing fixtures                           |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1200                      | Fire Alarm devices and finishes                    | 8                  | 09/03/20 | 09/15/20 | 63             | Fire Alarm devices and finishes                    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1190                      | Finish painting/acoustical wall panels             | 15                 | 09/04/20 | 09/25/20 | 44             | Finish painting/acoustical wall panels             |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1240                      | Misc. Division 10, 11, and 12                      | 15                 | 09/22/20 | 10/12/20 | 44             | Misc. Division 10, 11, and 12                      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1220                      | ATC finishes                                       | 5                  | 09/28/20 | 10/02/20 | 50             | ATC finishes                                       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1230                      | Electrical finishes and trim-out                   | 5                  | 09/28/20 | 10/02/20 | 50             | Electrical finishes and trim-out                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1290                      | Interior Signage                                   | 10                 | 09/28/20 | 10/09/20 | 45             | Interior Signage                                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1250                      | Clean-up and work list                             | 20                 | 10/13/20 | 11/09/20 | 44             | Clean-up and work list                             |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| L2F 1260                      | Complete Finishes - Second Floor                   | 0                  |          | 11/09/20 | 44             | Complete Finishes - Second Floor                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| First Floor                   |  | 182                | 02/28/20 | 11/12/20 | 42             |  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| Kitchen, Caf Rough-in         |  | 65                 | 02/28/20 | 05/29/20 | 42             |  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |
| KR 1000                       | Start Rough-in Work - First Floor                  | 0                  | 02/28/20 |          | 29             | Start Rough-in Work - First Floor                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |  |  |      |  |







| Activity ID           | Activity Name             | Orig Dur<br>(Days)                                   | Start  | Finish   | Total<br>Float | Q4       | 2018  |   |    |    | 2019 |    |    |    | 2020 |    |    |    | 2021 |    |    |    | 2022 |    |    |    | 2023 |    |    |    | 2024 |    | Q3 |  |  |
|-----------------------|---------------------------|--|--|----------|----------------|----------|---|---|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|--|--|
|                       |                           |  |  |          |                |          | Q1  | Q2  | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 |    |  |  |
| AF                    | 1820                      | Drywall Tape and Finish                              | 15   | 06/11/20 | 07/01/20       | 61       | <div><div></div><div>Drywall tape and Finish</div></div>                              |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1830                      | Painting - prime and one finish coat                 | 10   | 06/18/20 | 07/01/20       | 61       | <div><div></div><div>Painting - prime and one finish coat</div></div>                 |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1840                      | Frame for Gypsum/Hard Ceilings                       | 15   | 06/23/20 | 07/14/20       | 61       | <div><div></div><div>Frame for Gypsum/Hard Ceilings</div></div>                       |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1850                      | Light fixtures                                       | 15   | 06/30/20 | 07/21/20       | 66       | <div><div></div><div>Light fixtures</div></div>                                       |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1860                      | Interior storefronts/glass and glazing               | 8  | 07/02/20 | 07/14/20       | 88       | <div><div></div><div>Interior storefronts/glass and glazing</div></div>               |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1870                      | Doors and hardware                                   | 5  | 07/02/20 | 07/09/20       | 130      | <div><div></div><div>Doors and hardware</div></div>                                   |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1880                      | Sprinkler drops and heads                            | 10   | 07/02/20 | 07/16/20       | 61       | <div><div></div><div>Sprinkler drops and heads</div></div>                            |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1890                      | Millwork and casework                                | 20   | 07/02/20 | 07/30/20       | 86       | <div><div></div><div>Millwork and casework</div></div>                                |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1900                      | HVAC drops/RGD's                                     | 10   | 07/15/20 | 07/28/20       | 103      | <div><div></div><div>HVAC drops/RGD's</div></div>                                     |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1920                      | Install Hard ceilings                                | 10   | 07/17/20 | 07/30/20       | 61       | <div><div></div><div>Install Hard ceilings</div></div>                                |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1930                      | Finish painting/wall graphics/acoustical wall panels | 10   | 07/24/20 | 08/06/20       | 71       | <div><div></div><div>Finish painting/wall graphics/acoustical wall panels</div></div> |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1940                      | Fire Alarm devices and finishes                      | 5  | 07/31/20 | 08/06/20       | 96       | <div><div></div><div>Fire Alarm devices and finishes</div></div>                      |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 2070                      | Acoustical Wall, Ceiling Panels                      | 15   | 07/31/20 | 08/20/20       | 61       | <div><div></div><div>Acoustical Wall, Ceiling Panels</div></div>                      |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1950                      | Floor prep & finishes (Reslient & Carpet)            | 10   | 08/07/20 | 08/20/20       | 71       | <div><div></div><div>Floor prep &amp; finishes (Reslient &amp; Carpet)</div></div>    |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1960                      | ATC finishes   | 5  | 08/07/20 | 08/13/20       | 91       | <div><div></div><div>ATC finishes</div></div>   |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1970                      | Electrical finishes and trim-out                     | 5  | 08/07/20 | 08/13/20       | 91       | <div><div></div><div>Electrical finishes and trim-out</div></div>                     |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1980                      | Misc. Division 10, 11, and 12                        | 5  | 08/07/20 | 08/13/20       | 91       | <div><div></div><div>Misc. Division 10, 11, and 12</div></div>                        |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 2020                      | Stage, Wood Floor Prep & Installation                | 15   | 08/21/20 | 09/11/20       | 61       | <div><div></div><div>Stage, Wood Floor Prep &amp; Installation</div></div>            |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 2010                      | Install Theatrical Equipment                         | 10   | 09/14/20 | 09/25/20       | 61       | <div><div></div><div>Install Theatrical Equipment</div></div>                         |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 1990                      | Clean-up and work list Auditorium                    | 15   | 09/28/20 | 10/16/20       | 61       | <div><div></div><div>Clean-up and work list Auditorium</div></div>                    |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | 2000                      | Complete Finishes - First Floor Auditorium           | 0  |          | 10/16/20       | 61       | <div><div></div><div>Complete Finishes - First Floor Auditorium</div></div>           |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | Ground Floor - Automotive |  |  | 184      | 03/13/20       | 12/02/20 | 29  | <div><div></div><div></div></div>   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | Ground Floor Rough-in     |  |  | 65       | 03/13/20       | 06/12/20 | 29  | <div><div></div><div>Start Rough-in Work - Ground Floor</div></div>                     |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | CGR                       | 1000   | Start Rough-in Work - Ground Floor                 | 0        | 03/13/20       |          | 29  | <div><div></div><div>Rough-in HVAC duct work</div></div>                                |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | CGR                       | 1010   | Rough-in HVAC duct work                            | 20       | 03/13/20       | 04/09/20 | 29  | <div><div></div><div>Frame interior partitions w/door frames &amp; blocking</div></div> |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | CGR                       | 1020   | Frame interior partitions w/door frames & blocking | 20       | 03/13/20       | 04/09/20 | 29  | <div><div></div><div>Rough-in plumbing</div></div>                                      |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | CGR                       | 1030   | Rough-in plumbing                                  | 20       | 03/13/20       | 04/09/20 | 44  | <div><div></div><div>Rough-in HVAC piping</div></div>                                   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | CGR                       | 1040   | Rough-in HVAC piping                               | 20       | 03/27/20       | 04/23/20 | 29  | <div><div></div><div>Rough-in sprinkler</div></div>                                     |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
|                       | CGR                       | 1050   | Rough-in sprinkler                                 | 15       | 04/03/20       | 04/23/20 | 34  | <div><div></div><div>Rough-in electrical power, lighting</div></div>                    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGR                   | 1060                      | Rough-in electrical power, lighting                  | 20   | 04/10/20 | 05/07/20       | 29       | <div><div></div><div>Rough-in ATC controls</div></div>                                |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGR                   | 1070                      | Rough-in ATC controls                                | 15   | 05/01/20 | 05/21/20       | 34       | <div><div></div><div>Rough-in fire alarm</div></div>                                  |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGR                   | 1080                      | Rough-in fire alarm                                  | 20   | 05/01/20 | 05/29/20       | 29       | <div><div></div><div>Rough-in tel-data/security/PV</div></div>                        |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGR                   | 1090                      | Rough-in tel-data/security/PV                        | 20   | 05/01/20 | 05/29/20       | 29       | <div><div></div><div>MEP Inspections</div></div>                                      |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGR                   | 1100                      | MEP Inspections                                      | 10   | 06/01/20 | 06/12/20       | 29       | <div><div></div><div>Complete Rough-in Ground Floor</div></div>                       |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGR                   | 1110                      | Complete Rough-in Ground Floor                       | 0  |          | 06/12/20       | 29       | <div><div></div><div></div></div>   |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| Ground Floor Finishes |                           |  | 120  | 06/12/20 | 12/02/20       | 29       | <div><div></div><div>Start Finishes - Ground Floor</div></div>                        |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1000                      | Start Finishes - Ground Floor                        | 0  | 06/12/20 |                | 29       | <div><div></div><div>Building Insulation</div></div>                                  |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1010                      | Building Insulation                                  | 10   | 06/12/20 | 06/25/20       | 33       | <div><div></div><div>Plumbing Insulation</div></div>                                  |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1020                      | Plumbing Insulation                                  | 10   | 06/12/20 | 06/25/20       | 33       | <div><div></div><div>HVAC Insulation</div></div>                                      |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1030                      | HVAC Insulation                                      | 15   | 06/12/20 | 07/02/20       | 29       | <div><div></div><div>HVAC terminal equipment</div></div>                              |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1040                      | HVAC terminal equipment                              | 20   | 06/12/20 | 07/10/20       | 52       | <div><div></div><div>Hang Drywall</div></div>   |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1050                      | Hang Drywall   | 20   | 07/02/20 | 07/30/20       | 29       | <div><div></div><div>Drywall Tape and Finish</div></div>                              |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1060                      | Drywall Tape and Finish                              | 20   | 07/10/20 | 08/06/20       | 29       | <div><div></div><div>Painting - prime and one finish coat</div></div>                 |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1070                      | Painting - prime and one finish coat                 | 15   | 07/24/20 | 08/13/20       | 29       | <div><div></div><div>Acoustical ceiling grid</div></div>                              |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1080                      | Acoustical ceiling grid                              | 15   | 08/05/20 | 08/25/20       | 35       | <div><div></div><div>Millwork and casework</div></div>                                |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1140                      | Millwork and casework                                | 20   | 08/07/20 | 09/03/20       | 34       | <div><div></div><div>Light fixtures</div></div>                                       |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1090                      | Light fixtures                                       | 15   | 08/12/20 | 09/01/20       | 44       | <div><div></div><div>Interior storefronts/glass and glazing</div></div>               |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1100                      | Interior storefronts/glass and glazing               | 8  | 08/14/20 | 08/25/20       | 31       | <div><div></div><div>Doors and hardware</div></div>                                   |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1110                      | Doors and hardware                                   | 10   | 08/14/20 | 08/27/20       | 29       | <div><div></div><div>Install wall tile</div></div>                                    |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1120                      | Install wall tile                                    | 10   | 08/14/20 | 08/27/20       | 45       | <div><div></div><div>Sprinkler drops and heads</div></div>                            |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |
| CGF                   | 1130                      | Sprinkler drops and heads                            | 10   | 08/14/20 | 08/27/20       | 35       |   |   |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |  |  |

| Activity ID | Activity Name      | Orig Dur<br>(Days)                                     | Start | Finish   | Total<br>Float |     | 2018 |    |    |    | 2019 |    |    |    | 2020 |    |    |    | 2021 |    |    |    | 2022 |    |    |    | 2023 |    |    |    | 2024 |    |  |
|-------------|--------------------|--|-------|----------|----------------|-----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|--|
|             |                    |  |       |          |                |     | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 |  |
|             | CGF 1270           | Glass & Glazing  | 8     | 08/14/20 | 08/25/20       | 77  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | CGF 1150           | HVAC drops/RGD's                                       | 10    | 08/26/20 | 09/09/20       | 67  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | CGF 1160           | Sprinkler pipe test                                    | 4     | 08/28/20 | 09/02/20       | 35  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | CGF 1210           | Floor prep & finishes (Reslient & Carpet)              | 25    | 08/28/20 | 10/02/20       | 29  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | CGF 1280           | Epoxy Floor Prep & Finish                              | 5     | 08/28/20 | 09/03/20       | 45  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | CGF 1180           | Acoustical ceilings finish                             | 15    | 09/03/20 | 09/24/20       | 35  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | CGF 1170           | Toilet plumbing fixtures                               | 10    | 09/04/20 | 09/18/20       | 45  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | CGF 1200           | Fire Alarm devices and finishes                        | 8     | 09/25/20 | 10/06/20       | 48  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | CGF 1190           | Finish painting/acoustical wall panels                 | 15    | 09/28/20 | 10/16/20       | 29  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | CGF 1240           | Misc. Division 10, 11, and 12                          | 15    | 10/13/20 | 11/02/20       | 29  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | CGF 1220           | ATC finishes   | 5     | 10/19/20 | 10/23/20       | 35  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | CGF 1230           | Electrical finishes and trim-out                       | 5     | 10/19/20 | 10/23/20       | 35  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | CGF 1290           | Shop Equipment   | 10    | 10/19/20 | 10/30/20       | 30  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | CGF 1250           | Clean-up and work list                                 | 20    | 11/03/20 | 12/02/20       | 29  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | CGF 1260           | Complete Finishes - Ground Floor                       | 0     |          | 12/02/20       | 29  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | Elevators          |  | 319   | 10/18/19 | 01/22/21       | 29  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELE 1030           | Waterproof Elevator Pits                               | 10    | 10/18/19 | 10/31/19       | 193 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEV 100           | Construct Hoistways & Penthouses Elev 1&2              | 30    | 11/01/19 | 12/16/19       | 193 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEV 110           | Electrical Rough in                                    | 15    | 03/06/20 | 03/26/20       | 138 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEV 120           | Hoistway & Cab Finishes                                | 70    | 05/13/20 | 08/20/20       | 105 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEV 130           | Call for State Inspection                              | 30    | 12/10/20 | 01/22/21       | 29  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | Electrical Room    |  | 68    | 02/06/20 | 05/12/20       | 170 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEC1000           | Frame /blocking / sheetrock elec room walls            | 5     | 02/06/20 | 02/12/20       | 85  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEC1010           | Install Housekeeping pads                              | 5     | 02/13/20 | 02/20/20       | 85  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEC1020           | Prime & Paint First Coat                               | 4     | 02/21/20 | 02/26/20       | 101 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | RW3 1010           | Install Transformer                                    | 15    | 02/21/20 | 03/12/20       | 85  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEC1030           | Run feeds from new service to transformer              | 5     | 03/13/20 | 03/19/20       | 85  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEC1040           | Rough-in Supporting MEP's                              | 10    | 03/20/20 | 04/02/20       | 105 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEC1050           | Install switchgear and main distribution panels        | 30    | 03/20/20 | 04/30/20       | 85  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEC1060           | Electrical terminations and testing                    | 15    | 04/10/20 | 04/30/20       | 85  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEC1070           | Rough-in Inspection                                    | 3     | 05/01/20 | 05/05/20       | 85  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEC1080           | Final Paint  | 3     | 05/01/20 | 05/05/20       | 170 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEC1090           | Install Finishes                                       | 5     | 05/06/20 | 05/12/20       | 170 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | ELEC1100           | Switchover to new permanent power                      | 5     | 05/06/20 | 05/12/20       | 85  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | Mechanical Room    |  | 78    | 02/21/20 | 06/10/20       | 132 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | MECH1000           | Install Housekeeping pads                              | 5     | 02/21/20 | 02/27/20       | 103 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | MECH1010           | Install Louvers & Vents                                | 5     | 02/28/20 | 03/05/20       | 118 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | MECH1020           | Install HVAC mechanical room equipment - boilers       | 20    | 02/28/20 | 03/26/20       | 103 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | MECH1030           | Electrical rough-in                                    | 10    | 03/20/20 | 04/02/20       | 113 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | MECH1060           | ATC rough-in, terminations and check out               | 20    | 03/20/20 | 04/16/20       | 103 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | MECH1040           | Install duct work and HVAC piping                      | 10    | 03/27/20 | 04/09/20       | 103 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | MECH1050           | Plumbing rough-in                                      | 10    | 03/27/20 | 04/09/20       | 108 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | MECH1070           | HVAC Equip startup and testing (start floors finishes) | 15    | 05/13/20 | 06/03/20       | 85  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | MECH1080           | Complete Mech Systems - Ready for TAB                  | 5     | 06/04/20 | 06/10/20       | 132 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | Site Utilities     |  | 70    | 04/25/19 | 08/02/19       | 281 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | SU 1040            | Install storm drainage and structures                  | 30    | 04/25/19 | 06/06/19       | 281 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | SU 1010            | Install new electrical and tel/data                    | 20    | 05/31/19 | 06/27/19       | 263 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | SU 1070            | Install new gas service                                | 20    | 05/31/19 | 06/27/19       | 306 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | SU 1050            | Install new sanitary & Grease Trap                     | 20    | 06/07/19 | 07/05/19       | 281 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | SU 1060            | Install new water and FP service                       | 20    | 07/08/19 | 08/02/19       | 281 |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |
|             | Site Work Finishes |  | 65    | 03/15/21 | 06/11/21       | -9  |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |



| Activity ID                       | Activity Name                                       | Orig Dur<br>(Days)                          | Start     | Finish    | Total<br>Float | 2018  |   |    |    |    | 2019 |    |    |    | 2020 |    |    |    | 2021 |    |    |    | 2022 |    |    |    | 2023 |    |    |    | 2024 |  |
|-----------------------------------|---|---|-----------|-----------|----------------|---|---|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|--|
|                                   |   |   |           |           |                | Q1  | Q2  | Q3 | Q4 | Q1 | Q2   | Q3 | Q4 | Q1 | Q2   | Q3 | Q4 | Q1 | Q2   | Q3 | Q4 | Q1 | Q2   | Q3 | Q4 | Q1 | Q2   | Q3 | Q4 | Q1 | Q2   |  |
| 1SIT 1000                         | Start Final Site work                               | 0   | 03/15/21* | 03/15/21  | -9             | Start Final Site work                               |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | Concrete Walkways                                   | 60  | 03/15/21  | 06/04/21  | -4             |   |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1010   | Excavate to grade                           | 20        | 03/15/21  | 04/09/21       | -9  | Excavate to grade                           |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1020   | Install formwork                            | 25        | 03/29/21  | 04/30/21       | -9  | Install formwork                            |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1030   | Install expansion joints                    | 20        | 04/05/21  | 04/30/21       | -9  | Install expansion joints                    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1040   | Install steel reinforcement                 | 20        | 04/05/21  | 04/30/21       | -9  | Install steel reinforcement                 |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1050   | Place concrete walkways                     | 20        | 05/03/21  | 05/28/21       | -9  | Place concrete walkways                     |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1060   | Set detectable warning strips               | 5         | 05/31/21  | 06/04/21       | -4  | Set detectable warning strips               |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | Site Improvements                                   | 45  | 04/12/21  | 06/11/21  | -9             |   |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1190   | Install site walls                          | 30        | 04/12/21  | 05/21/21       | 6   | Install site walls                          |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1210   | Install site lighting                       | 40        | 04/12/21  | 06/04/21       | -4  | Install site lighting                       |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1100   | Install permanent fence                     | 30        | 05/03/21  | 06/11/21       | -9  | Install permanent fence                     |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1080   | Install bike racks                          | 10        | 05/31/21  | 06/11/21       | -9  | Install bike racks                          |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1090   | Install benches                             | 10        | 05/31/21  | 06/11/21       | -9  | Install benches                             |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | Asphalt Paving                                      | 60  | 03/15/21  | 06/04/21  | -4             |   |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1110   | Excavate and prep for sub-base              | 20        | 03/15/21  | 04/09/21       | -9  | Excavate and prep for sub-base              |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1120   | Lay 8" gravel sub-base                      | 15        | 03/29/21  | 04/16/21       | -4  | Lay 8" gravel sub-base                      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1140   | Install binder course                       | 10        | 04/19/21  | 04/30/21       | -4  | Install binder course                       |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1130   | Install curbs/berms                         | 20        | 05/03/21  | 05/28/21       | -4  | Install curbs/berms                         |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1150   | Install top course                          | 5         | 05/31/21  | 06/04/21       | -4  | Install top course                          |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | Lawns and Planting                                  | 20  | 05/17/21  | 06/11/21  | -9             |   |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1160   | Rough Grade, Install loam                   | 10        | 05/17/21  | 05/28/21       | -9  | Rough Grade, Install loam                   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1200   | Install Planters                            | 10        | 05/17/21  | 05/28/21       | 1   | Install Planters                            |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1170   | Lay mulch and other finishes                | 10        | 05/31/21  | 06/11/21       | -9  | Lay mulch and other finishes                |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | 1SIT 1180   | Perform fine grading/planting/seeding       | 10        | 05/31/21  | 06/11/21       | -9  | Perform fine grading/planting/seeding       |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | Phase 1 Building Turnover                           |   | 146       | 11/03/20  | 06/01/21       | 0   |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | Substantial completion                              |   | 85        | 11/03/20  | 03/05/21       | 29  |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | COMP1090  | HVAC test and balance                       | 40        | 11/03/20  | 12/31/20       | 31  | HVAC test and balance                       |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | COMP1010  | As-Built's, Warrantees, O&Ms                | 40        | 12/03/20  | 01/29/21       | 41  | As-Built's, Warrantees, O&Ms                |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | COMP1020  | Completion of all building contract work    | 0         | 12/03/20  | 12/03/20       | 29  | Completion of all building contract work    |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | COMP1030  | Plumbing final inspections and sign-off     | 3         | 12/03/20  | 12/07/20       | 86  | Plumbing final inspections and sign-off     |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | COMP1040  | Fire alarm Pre-testing                      | 5         | 12/03/20  | 12/09/20       | 29  | Fire alarm Pre-testing                      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
|                                   | COMP1070  | Architect's Final Punch List and Back Punch | 30        | 12/03/20  | 01/15/21       | 33  | Architect's Final Punch List and Back Punch |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1060                          | Fire protection flow test                           | 5   | 12/10/20  | 12/16/20  | 59             | Fire protection flow test                           |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1110                          | Primary systems Commissioning                       | 35  | 01/04/21  | 02/19/21  | 31             | Primary systems Commissioning                       |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1080                          | Provide owner training                              | 25  | 01/04/21  | 02/05/21  | 48             | Provide owner training                              |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1230                          | Building Flush Out                                  | 30  | 01/18/21  | 02/26/21  | 33             | Building Flush Out                                  |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1050                          | Electrical final inspections and sign-off           | 5   | 01/25/21  | 01/29/21  | 29             | Electrical final inspections and sign-off           |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1180                          | Elevator final inspections and sign-off             | 5   | 01/25/21  | 01/29/21  | 29             | Elevator final inspections and sign-off             |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1100                          | Fire Department inspection and sign-off Alarm       | 5   | 02/01/21  | 02/05/21  | 44             | Fire Department inspection and sign-off Alarm       |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1210                          | Fire Department inspection and sign-off Sprinkler   | 5   | 02/01/21  | 02/05/21  | 29             | Fire Department inspection and sign-off Sprinkler   |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1220                          | Fire Department inspection and sign-off Life Safety | 5   | 02/22/21  | 02/26/21  | 29             | Fire Department inspection and sign-off Life Safety |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1140                          | Final insp, sign-off, Cert. of Occupancy            | 5   | 03/01/21  | 03/05/21  | 29             | Final insp, sign-off, Cert. of Occupancy            |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1150                          | SUBSTANTIAL COMPLETION - Phase 1 Projected          | 0   | 03/05/21  | 03/05/21  | 29             | SUBSTANTIAL COMPLETION - Phase 1 Projected          |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| Completion and Closeout - Phase 1 |   | 96  | 01/18/21  | 06/01/21  | 0              |   |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1120                          | Complete remaining open punch list items            | 40  | 01/18/21  | 03/12/21  | 56             | Complete remaining open punch list items            |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1130                          | Warrantees,Cbseout Documents                        | 45  | 02/01/21  | 04/02/21  | 41             | Warrantees,Cbseout Documents                        |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1160                          | Address CX corrective actions                       | 40  | 02/22/21  | 04/16/21  | 31             | Address CX corrective actions                       |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1190                          | SUBSTANTIAL COMPLETION - Phase 1 - Required         | 0   | 04/15/21  | 04/15/21* | 0              | SUBSTANTIAL COMPLETION - Phase 1 - Required         |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1200                          | FINAL COMPLETION - Phase 1 Projected                | 0   | 04/19/21  | 04/19/21  | 31             | FINAL COMPLETION - Phase 1 Projected                |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |
| COMP1170                          | FINAL COMPLETION - Phase 1 Required                 | 0   | 06/01/21  | 06/01/21* | 0              | FINAL COMPLETION -Phase 1 Required                  |   |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |  |

| Activity ID |           | Activity Name                                     | Orig Dur<br>(Days) | Start     | Finish    | Total<br>Float | 2018 |    |    |    | 2019 |    |    |    | 2020 |    |    |    | 2021 |    |    |    | 2022 |    |    |    | 2023 |    |  |  | 2024 |  | 30 |  |
|-------------|-----------|---|--------------------|-----------|-----------|----------------|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|----|----|------|----|--|--|------|--|----|--|
|             |           |   |                    |           |           |                | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 | Q3 | Q4 | Q1   | Q2 |  |  |      |  |    |  |
|             |           | Phase 2 - Demolition                              | 100                | 07/01/21  | 11/17/21  | 9              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             |           | Building Abatement & Demolition                   | 100                | 07/01/21  | 11/17/21  | 9              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2030  | Mobilize Abatement Contractor                     | 0                  | 07/01/21* | 07/01/21  | 9              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2210  | Conduct Abatement in existing building            | 60                 | 07/01/21  | 09/22/21  | 9              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2220  | Demolish existing Building and Foundations        | 40                 | 09/23/21  | 11/17/21* | 9              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             |           | Phase 3 - Athletics                               | 70                 | 04/01/22  | 07/07/22  | 5              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             |           | Athletic Facilities                               | 70                 | 04/01/22  | 07/07/22  | 5              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | ATH 100   | Site Preparation                                  | 15                 | 04/01/22* | 04/21/22  | 5              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | ATH 110   | Rough Grade and Prepare Sub Base                  | 15                 | 04/08/22  | 04/28/22  | 5              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | ATH 120   | Install Grandstand Footings                       | 15                 | 04/08/22  | 04/28/22  | 15             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | ATH 130   | Install Grandstand Structure                      | 15                 | 04/29/22  | 05/19/22  | 40             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | ATH 140   | Install Turf                                      | 20                 | 04/29/22  | 05/26/22  | 10             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | ATH 160   | Install Fencing                                   | 30                 | 04/29/22  | 06/09/22  | 25             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | ATH 180   | Construct Out Buildings                           | 50                 | 04/29/22  | 07/07/22  | 5              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | ATH 190   | Install Stairs                                    | 30                 | 04/29/22  | 06/09/22  | 25             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | ATH 200   | Install drainage and utilities                    | 15                 | 04/29/22  | 05/19/22  | 10             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | ATH 150   | Install Track                                     | 25                 | 05/27/22  | 06/30/22  | 10             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | ATH 170   | Install Goal Posts, Scoreboards, Site Furnishings | 10                 | 06/17/22  | 06/30/22  | 10             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             |           | Asphalt Paving                                    | 55                 | 04/08/22  | 06/23/22  | 15             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2000  | Excavate and prep for sub-base                    | 15                 | 04/08/22  | 04/28/22  | 15             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2010  | Lay 8" gravel sub-base                            | 15                 | 04/15/22  | 05/05/22  | 15             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2020  | Install binder course                             | 10                 | 05/06/22  | 05/19/22  | 15             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2040  | Install curbs/berms                               | 20                 | 05/20/22  | 06/16/22  | 15             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2060  | Install top course                                | 5                  | 06/17/22  | 06/23/22  | 15             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             |           | Concrete Walkways                                 | 45                 | 04/08/22  | 06/09/22  | 25             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2050  | Excavate to grade                                 | 20                 | 04/08/22  | 05/05/22  | 25             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2080  | Install formwork                                  | 30                 | 04/08/22  | 05/19/22  | 25             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2100  | Install steel reinforcement                       | 30                 | 04/15/22  | 05/26/22  | 25             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2110  | Place concrete walkways                           | 30                 | 04/22/22  | 06/02/22  | 25             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2150  | Set detectable warning strips                     | 5                  | 06/03/22  | 06/09/22  | 25             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             |           | Site Improvements                                 | 45                 | 04/08/22  | 06/09/22  | 25             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2190  | Install site walls, seating, amphitheater         | 40                 | 04/08/22  | 06/02/22  | 30             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2140  | Install permanent fence                           | 25                 | 04/22/22  | 05/26/22  | 35             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2120  | Install bike racks                                | 10                 | 05/27/22  | 06/09/22  | 25             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | SITE2130  | Install benches                                   | 10                 | 05/27/22  | 06/09/22  | 25             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             |           | Phase 3 Close Out                                 | 70                 | 05/20/22  | 08/26/22  | 0              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             |           | Substantial completion                            | 40                 | 05/20/22  | 07/14/22  | 11             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | 3CLO 1050 | As-Builts, Warrantees, O&Ms                       | 30                 | 05/20/22  | 06/30/22  | 10             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | 3CLO 1060 | Completion of all building contract work          | 0                  | 07/01/22  | 07/01/22  | 10             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | 3CLO 1110 | Architect's Punch List                            | 5                  | 07/01/22  | 07/07/22  | 14             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | 3CLO 1150 | Final insp, sign-off, Cert. of Occupancy          | 2                  | 07/07/22  | 07/08/22  | 14             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | 3CLO 1120 | Provide owner training                            | 5                  | 07/08/22  | 07/14/22  | 5              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | 3CLO 1160 | Substantial Completion Phase 3 Projected          | 0                  | 07/08/22  | 07/08/22  | 16             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             |           | Completion and Closeout - Phase 3                 | 35                 | 07/08/22  | 08/26/22  | 0              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | 3CLO 1000 | Complete all punch list items                     | 15                 | 07/08/22  | 07/28/22  | 20             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | 3CLO 1010 | Warrantees,Cbseout Documents                      | 30                 | 07/08/22  | 08/18/22  | 5              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | 3CLO 1020 | Address all CX corrective actions                 | 20                 | 07/11/22  | 08/05/22  | 14             |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | 3CLO 1170 | Substantial Completion Phase 3 Required           | 0                  | 07/30/22  | 07/30/22* | 0              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | 3CLO 1030 | FINAL COMPLETION - Projected                      | 0                  | 08/19/22  | 08/19/22  | 5              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |
|             | 3CLO 1040 | FINAL COMPLETION - Required                       | 0                  | 08/26/22  | 08/26/22* | 0              |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |    |    |      |    |  |  |      |  |    |  |

THE COMMONWEALTH OF MASSACHUSETTS  
DEPARTMENT OF REVENUE  
DETERMINATIONS BUREAU

## EXEMPT PURCHASER CERTIFICATE

MASSACHUSETTS DEPARTMENT OF REVENUE  
CERTIFICATE OF EXEMPTION

Certification is hereby made that the organization herein named is an exempt purchaser under General Laws, Chapter 64H, Sections 6(d) and (e). All purchases of tangible personal property by this organization are exempt from taxation under said chapter to the extent that such property is used in the conduct of the business of the purchaser. Any abuse or misuse of this certificate by any tax exempt organization or any unauthorized use of this certificate by any individual constitutes a serious violation and will lead to revocation. Willful misuse of this Certificate of Exemption is subject to criminal sanctions of up to 1 year in prison and \$10,000 (\$50,000 for corporations) in fines.

PLEASE  
COMPLETE  
THIS  
SECTION

|         |                   |       |               |
|---------|-------------------|-------|---------------|
| NAME    | City of Worcester |       |               |
| ADDRESS | 455 Main Street   |       |               |
| CITY    | Worcester         | STATE | MA. ZIP 01608 |

EXEMPTION NUMBER 046-001-418

ISSUE DATE 1/02/90

CERTIFICATE EXPIRES ON None

NOT ASSIGNABLE OR TRANSFERABLE

COMMISSIONER OF REVENUE

Purchased from \_\_\_\_\_

Description of Property to be Purchased All items purchased by the City of Worcester  
which are covered by City of Worcester purchase orders.

Signed Under the Pains and Penalties of Perjury

Dated JULY 5 19 92

Signature Thomas F. RohrerBy (title) TreasurerCheck Applicable Box ☐ Single Purchase Certificate ☐ Blanket Certificate ☒INSTRUCTIONS FOR USE OF EXEMPT PURCHASER CERTIFICATE

Sales to the United States, the Commonwealth or to any political subdivision thereof or to their respective agencies are exempt.

Sales to any Corporation, Foundation, Organization or Institution which is exempt from taxation under the provisions of §501 (c)(3) of the U. S. Internal Revenue Code, as amended and in effect for the applicable period, are exempt from tax provided that:

- The tangible personal property which is subject to such Sales Tax is used in the conduct of such Organization or Agency;
- The Organization or Agency shall have obtained: a Certificate of Exemption (Form ST-2) from the Commissioner of Revenue certifying that it is entitled to exemption and shall attach a photocopy of such form (ST-2) hereto;
- The Vendor must retain a copy of Form ST-5 accompanied by Form ST-2 as are other tax records. See Record Retention Regulation 830 CMR 62C.24

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Document 00 73 43  
AFFIDAVIT OF PREVAILING WAGE COMPLIANCE  
(Bid Form Attachment)

..... I, ....., President ..... Clerk of .....

.....  
(Name of Corporation)

whose principal office is located at

.....

.....

do hereby certify that the above named corporation complies with the prevailing wage law as set forth in Sections 26 and 27 of Chapter 149 of the Massachusetts General Laws and do hereby further certify that the Corporation named above shall comply with the Davis-Bacon Act set forth in 29 CFR Parts 1, 3 and 5, and as said law is references, in Article X, Section 2, Paragraph L of the General Conditions of the Contract between the Owner and Construction Manager.

SIGNED UNDER PENALTIES OF PERJURY

this .....day of ....., 2015

.....  
(Signature of Responsible Corporate Officer)

..... Mass.Business Corp. .... Foreign Corp. ....Non-Profit  
Corp.

End of Document

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**DOCUMENT 00 73 43A**

**MASSACHUSETTS PREVAILING WAGE RATES  
AND ATTACHMENTS**

**(DOCUMENT 00800)**

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CHARLES D. BAKER  
Governor

KARYN E. POLITO  
Lt. Governor

THE COMMONWEALTH OF MASSACHUSETTS  
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT  
DEPARTMENT OF LABOR STANDARDS

**Prevailing Wage Rates**

**As determined by the Director under the provisions of the  
Massachusetts General Laws, Chapter 149, Sections 26 to 27H**

ROSALIN ACOSTA  
Secretary  
WILLIAM D MCKINNEY  
Director

**Awarding Authority:** City of Worcester  
**Contract Number:** 1507 **City/Town:** WORCESTER  
**Description of Work:** Worcester South Community High School Construction  
**Job Location:** 170 Apricot Street, Worcester, MA 01605

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Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule from the Department of Labor Standards ("DLS") if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Department of Labor Standards, Division of Apprentice Standards (DLS/DAS). Apprentice must keep his/her apprentice identification card on his/her person during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DLS/DAS regardless of whether or not they are registered with any other federal, state, local, or private agency must be paid the journeyworker's rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at <http://www.mass.gov/dols/pw>.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and

| Classification  | Effective Date | Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|---|----------------|-----------|---------|---------|------------------------------|------------|
| <b>Construction</b>   |                |           |         |         |                              |            |
| (2 AXLE) DRIVER - EQUIPMENT<br><i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>               | 12/01/2016     | \$32.15   | \$10.91 | \$10.89 | \$0.00                       | \$53.95    |
| (3 AXLE) DRIVER - EQUIPMENT<br><i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>               | 12/01/2016     | \$32.22   | \$10.91 | \$10.89 | \$0.00                       | \$54.02    |
| (4 & 5 AXLE) DRIVER - EQUIPMENT<br><i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>           | 12/01/2016     | \$32.34   | \$10.91 | \$10.89 | \$0.00                       | \$54.14    |
| ADS/SUBMERSIBLE PILOT<br><i>PILE DRIVER LOCAL 56 (ZONE 2)</i>                             | 08/01/2017     | \$92.97   | \$9.90  | \$21.15 | \$0.00                       | \$124.02   |
|   | 08/01/2018     | \$97.80   | \$9.90  | \$21.15 | \$0.00                       | \$128.85   |
|   | 08/01/2019     | \$102.78  | \$9.90  | \$21.15 | \$0.00                       | \$133.83   |
| For apprentice rates see "Apprentice- PILE DRIVER"  |                |           |         |         |                              |            |
| AIR TRACK OPERATOR<br><i>LABORERS - ZONE 2</i>  | 12/01/2017     | \$33.58   | \$7.70  | \$13.60 | \$0.00                       | \$54.88    |
|   | 06/01/2018     | \$34.42   | \$7.70  | \$13.60 | \$0.00                       | \$55.72    |
|   | 12/01/2018     | \$35.26   | \$7.70  | \$13.60 | \$0.00                       | \$56.56    |
|   | 06/01/2019     | \$36.13   | \$7.70  | \$13.60 | \$0.00                       | \$57.43    |
|   | 12/01/2019     | \$36.99   | \$7.70  | \$13.60 | \$0.00                       | \$58.29    |
|   | 06/01/2020     | \$37.88   | \$7.70  | \$13.60 | \$0.00                       | \$59.18    |
|   | 12/01/2020     | \$38.77   | \$7.70  | \$13.60 | \$0.00                       | \$60.07    |
|   | 06/01/2021     | \$39.69   | \$7.70  | \$13.60 | \$0.00                       | \$60.99    |
|   | 12/01/2021     | \$40.60   | \$7.70  | \$13.60 | \$0.00                       | \$61.90    |
| For apprentice rates see "Apprentice- LABORER"  |                |           |         |         |                              |            |
| ASBESTOS WORKER (PIPES & TANKS)<br><i>HEAT &amp; FROST INSULATORS LOCAL 6 (WORCESTER)</i> | 12/01/2017     | \$35.90   | \$11.50 | \$7.10  | \$0.00                       | \$54.50    |
|   | 06/01/2018     | \$36.90   | \$11.50 | \$7.10  | \$0.00                       | \$55.50    |
|   | 12/01/2018     | \$37.90   | \$11.50 | \$7.10  | \$0.00                       | \$56.50    |
|   | 06/01/2019     | \$38.90   | \$11.50 | \$7.10  | \$0.00                       | \$57.50    |
|   | 12/01/2019     | \$39.90   | \$11.50 | \$7.10  | \$0.00                       | \$58.50    |
|   | 06/01/2020     | \$40.90   | \$11.50 | \$7.10  | \$0.00                       | \$59.50    |
|   | 12/01/2020     | \$41.90   | \$11.50 | \$7.10  | \$0.00                       | \$60.50    |
| ASPHALT RAKER<br><i>LABORERS - ZONE 2</i>   | 12/01/2017     | \$33.08   | \$7.70  | \$13.60 | \$0.00                       | \$54.38    |
|   | 06/01/2018     | \$33.92   | \$7.70  | \$13.60 | \$0.00                       | \$55.22    |
|   | 12/01/2018     | \$34.76   | \$7.70  | \$13.60 | \$0.00                       | \$56.06    |
|   | 06/01/2019     | \$35.63   | \$7.70  | \$13.60 | \$0.00                       | \$56.93    |
|   | 12/01/2019     | \$36.49   | \$7.70  | \$13.60 | \$0.00                       | \$57.79    |
|   | 06/01/2020     | \$37.38   | \$7.70  | \$13.60 | \$0.00                       | \$58.68    |
|   | 12/01/2020     | \$38.27   | \$7.70  | \$13.60 | \$0.00                       | \$59.57    |
|   | 06/01/2021     | \$39.19   | \$7.70  | \$13.60 | \$0.00                       | \$60.49    |
|   | 12/01/2021     | \$40.10   | \$7.70  | \$13.60 | \$0.00                       | \$61.40    |
| For apprentice rates see "Apprentice- LABORER"  |                |           |         |         |                              |            |
| ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE<br><i>OPERATING ENGINEERS LOCAL 4</i>              | 12/01/2017     | \$46.63   | \$10.50 | \$15.50 | \$0.00                       | \$72.63    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                                |                |           |         |         |                              |            |
| BACKHOE/FRONT-END LOADER<br><i>OPERATING ENGINEERS LOCAL 4</i>                            | 12/01/2017     | \$46.63   | \$10.50 | \$15.50 | \$0.00                       | \$72.63    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                                |                |           |         |         |                              |            |

| Classification  | Effective Date | Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|---|----------------|-----------|--------|---------|------------------------------|------------|
| BARCO-TYPE JUMPING TAMPER<br><i>LABORERS - ZONE 2</i>         | 12/01/2017     | \$33.08   | \$7.70 | \$13.60 | \$0.00                       | \$54.38    |
|   | 06/01/2018     | \$33.92   | \$7.70 | \$13.60 | \$0.00                       | \$55.22    |
|   | 12/01/2018     | \$34.76   | \$7.70 | \$13.60 | \$0.00                       | \$56.06    |
|   | 06/01/2019     | \$35.63   | \$7.70 | \$13.60 | \$0.00                       | \$56.93    |
|   | 12/01/2019     | \$36.49   | \$7.70 | \$13.60 | \$0.00                       | \$57.79    |
|   | 06/01/2020     | \$37.38   | \$7.70 | \$13.60 | \$0.00                       | \$58.68    |
|   | 12/01/2020     | \$38.27   | \$7.70 | \$13.60 | \$0.00                       | \$59.57    |
|   | 06/01/2021     | \$39.19   | \$7.70 | \$13.60 | \$0.00                       | \$60.49    |
|   | 12/01/2021     | \$40.10   | \$7.70 | \$13.60 | \$0.00                       | \$61.40    |
| For apprentice rates see "Apprentice- LABORER"                |                |           |        |         |                              |            |
| BLOCK PAVER, RAMMER / CURB SETTER<br><i>LABORERS - ZONE 2</i> | 12/01/2017     | \$33.58   | \$7.70 | \$13.60 | \$0.00                       | \$54.88    |
|   | 06/01/2018     | \$34.42   | \$7.70 | \$13.60 | \$0.00                       | \$55.72    |
|   | 12/01/2018     | \$35.26   | \$7.70 | \$13.60 | \$0.00                       | \$56.56    |
|   | 06/01/2019     | \$36.13   | \$7.70 | \$13.60 | \$0.00                       | \$57.43    |
|   | 12/01/2019     | \$36.99   | \$7.70 | \$13.60 | \$0.00                       | \$58.29    |
|   | 06/01/2020     | \$37.88   | \$7.70 | \$13.60 | \$0.00                       | \$59.18    |
|   | 12/01/2020     | \$38.77   | \$7.70 | \$13.60 | \$0.00                       | \$60.07    |
|   | 06/01/2021     | \$39.69   | \$7.70 | \$13.60 | \$0.00                       | \$60.99    |
|   | 12/01/2021     | \$40.60   | \$7.70 | \$13.60 | \$0.00                       | \$61.90    |
| For apprentice rates see "Apprentice- LABORER"                |                |           |        |         |                              |            |
| BOILER MAKER<br><i>BOILERMAKERS LOCAL 29</i>                  | 01/01/2017     | \$42.92   | \$6.97 | \$16.21 | \$0.00                       | \$66.10    |

**Apprentice - BOILERMAKER - Local 29**

**Effective Date - 01/01/2017**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 65      | \$27.90              | \$6.97 | \$10.54 | \$0.00                       | \$45.41    |
| 2    | 65      | \$27.90              | \$6.97 | \$10.54 | \$0.00                       | \$45.41    |
| 3    | 70      | \$30.04              | \$6.97 | \$11.35 | \$0.00                       | \$48.36    |
| 4    | 75      | \$32.19              | \$6.97 | \$12.16 | \$0.00                       | \$51.32    |
| 5    | 80      | \$34.34              | \$6.97 | \$12.97 | \$0.00                       | \$54.28    |
| 6    | 85      | \$36.48              | \$6.97 | \$13.78 | \$0.00                       | \$57.23    |
| 7    | 90      | \$38.63              | \$6.97 | \$14.59 | \$0.00                       | \$60.19    |
| 8    | 95      | \$40.77              | \$6.97 | \$15.40 | \$0.00                       | \$63.14    |

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

| Classification  | Effective Date | Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|---|----------------|-----------|---------|---------|------------------------------|------------|
| BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY<br>WATERPROOFING)<br><i>BRICKLAYERS LOCAL 3 (WORCESTER)</i> | 03/01/2018     | \$49.96   | \$10.75 | \$19.43 | \$0.00                       | \$80.14    |
|   | 08/01/2018     | \$51.31   | \$10.75 | \$19.56 | \$0.00                       | \$81.62    |
|   | 02/01/2019     | \$51.91   | \$10.75 | \$19.56 | \$0.00                       | \$82.22    |
|   | 08/01/2019     | \$53.26   | \$10.75 | \$19.70 | \$0.00                       | \$83.71    |
|   | 02/01/2020     | \$53.86   | \$10.75 | \$19.70 | \$0.00                       | \$84.31    |
|   | 08/01/2020     | \$55.21   | \$10.75 | \$19.85 | \$0.00                       | \$85.81    |
|   | 02/01/2021     | \$55.81   | \$10.75 | \$19.85 | \$0.00                       | \$86.41    |
|   | 08/01/2021     | \$57.21   | \$10.75 | \$20.01 | \$0.00                       | \$87.97    |
|   | 02/01/2022     | \$57.79   | \$10.75 | \$20.01 | \$0.00                       | \$88.55    |

**Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Worcester**

**Effective Date - 03/01/2018**

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|------------------------------|------------|
| 1    | 50      | \$24.98              | \$10.75 | \$19.43 | \$0.00                       | \$55.16    |
| 2    | 60      | \$29.98              | \$10.75 | \$19.43 | \$0.00                       | \$60.16    |
| 3    | 70      | \$34.97              | \$10.75 | \$19.43 | \$0.00                       | \$65.15    |
| 4    | 80      | \$39.97              | \$10.75 | \$19.43 | \$0.00                       | \$70.15    |
| 5    | 90      | \$44.96              | \$10.75 | \$19.43 | \$0.00                       | \$75.14    |

**Effective Date - 08/01/2018**

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|------------------------------|------------|
| 1    | 50      | \$25.66              | \$10.75 | \$19.56 | \$0.00                       | \$55.97    |
| 2    | 60      | \$30.79              | \$10.75 | \$19.56 | \$0.00                       | \$61.10    |
| 3    | 70      | \$35.92              | \$10.75 | \$19.56 | \$0.00                       | \$66.23    |
| 4    | 80      | \$41.05              | \$10.75 | \$19.56 | \$0.00                       | \$71.36    |
| 5    | 90      | \$46.18              | \$10.75 | \$19.56 | \$0.00                       | \$76.49    |

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

|  |            |         |         |         |        |         |
|--|------------|---------|---------|---------|--------|---------|
| BULLDOZER/GRADER/SCRAPER<br><i>OPERATING ENGINEERS LOCAL 4</i> | 12/01/2017 | \$46.17 | \$10.50 | \$15.50 | \$0.00 | \$72.17 |
|--|------------|---------|---------|---------|--------|---------|

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

|  |            |         |        |         |        |         |
|--|------------|---------|--------|---------|--------|---------|
| CAISSON & UNDERPINNING BOTTOM MAN<br><i>LABORERS - FOUNDATION AND MARINE</i> | 12/01/2017 | \$38.60 | \$7.70 | \$14.95 | \$0.00 | \$61.25 |
|  | 06/01/2018 | \$39.55 | \$7.70 | \$14.95 | \$0.00 | \$62.20 |
|  | 12/01/2018 | \$40.50 | \$7.70 | \$14.95 | \$0.00 | \$63.15 |
|  | 06/01/2019 | \$41.50 | \$7.70 | \$14.95 | \$0.00 | \$64.15 |
|  | 12/01/2019 | \$42.50 | \$7.70 | \$14.95 | \$0.00 | \$65.15 |
|  | 06/01/2020 | \$43.49 | \$7.70 | \$14.95 | \$0.00 | \$66.14 |
|  | 12/01/2020 | \$44.47 | \$7.70 | \$14.95 | \$0.00 | \$67.12 |
|  | 06/01/2021 | \$45.49 | \$7.70 | \$14.95 | \$0.00 | \$68.14 |
|  | 12/01/2021 | \$46.50 | \$7.70 | \$14.95 | \$0.00 | \$69.15 |

For apprentice rates see "Apprentice- LABORER"

| Classification  | Effective Date | Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|---|----------------|-----------|--------|---------|------------------------------|------------|
| CAISSON & UNDERPINNING LABORER<br><i>LABORERS - FOUNDATION AND MARINE</i> | 12/01/2017     | \$37.45   | \$7.70 | \$14.95 | \$0.00                       | \$60.10    |
|   | 06/01/2018     | \$38.40   | \$7.70 | \$14.95 | \$0.00                       | \$61.05    |
|   | 12/01/2018     | \$39.35   | \$7.70 | \$14.95 | \$0.00                       | \$62.00    |
|   | 06/01/2019     | \$40.35   | \$7.70 | \$14.95 | \$0.00                       | \$63.00    |
|   | 12/01/2019     | \$41.35   | \$7.70 | \$14.95 | \$0.00                       | \$64.00    |
|   | 06/01/2020     | \$42.34   | \$7.70 | \$14.95 | \$0.00                       | \$64.99    |
|   | 12/01/2020     | \$43.32   | \$7.70 | \$14.95 | \$0.00                       | \$65.97    |
|   | 06/01/2021     | \$44.34   | \$7.70 | \$14.95 | \$0.00                       | \$66.99    |
|   | 12/01/2021     | \$45.35   | \$7.70 | \$14.95 | \$0.00                       | \$68.00    |
| For apprentice rates see "Apprentice- LABORER"                            |                |           |        |         |                              |            |
| CAISSON & UNDERPINNING TOP MAN<br><i>LABORERS - FOUNDATION AND MARINE</i> | 12/01/2017     | \$37.45   | \$7.70 | \$14.95 | \$0.00                       | \$60.10    |
|   | 06/01/2018     | \$38.40   | \$7.70 | \$14.95 | \$0.00                       | \$61.05    |
|   | 12/01/2018     | \$39.35   | \$7.70 | \$14.95 | \$0.00                       | \$62.00    |
|   | 06/01/2019     | \$40.35   | \$7.70 | \$14.95 | \$0.00                       | \$63.00    |
|   | 12/01/2019     | \$41.35   | \$7.70 | \$14.95 | \$0.00                       | \$64.00    |
|   | 06/01/2020     | \$42.34   | \$7.70 | \$14.95 | \$0.00                       | \$64.99    |
|   | 12/01/2020     | \$43.32   | \$7.70 | \$14.95 | \$0.00                       | \$65.97    |
|   | 06/01/2021     | \$44.34   | \$7.70 | \$14.95 | \$0.00                       | \$66.99    |
|   | 12/01/2021     | \$45.35   | \$7.70 | \$14.95 | \$0.00                       | \$68.00    |
| For apprentice rates see "Apprentice- LABORER"                            |                |           |        |         |                              |            |
| CARBIDE CORE DRILL OPERATOR<br><i>LABORERS - ZONE 2</i>                   | 12/01/2017     | \$33.08   | \$7.70 | \$13.60 | \$0.00                       | \$54.38    |
|   | 06/01/2018     | \$33.92   | \$7.70 | \$13.60 | \$0.00                       | \$55.22    |
|   | 12/01/2018     | \$34.76   | \$7.70 | \$13.60 | \$0.00                       | \$56.06    |
|   | 06/01/2019     | \$35.63   | \$7.70 | \$13.60 | \$0.00                       | \$56.93    |
|   | 12/01/2019     | \$36.49   | \$7.70 | \$13.60 | \$0.00                       | \$57.79    |
|   | 06/01/2020     | \$37.38   | \$7.70 | \$13.60 | \$0.00                       | \$58.68    |
|   | 12/01/2020     | \$38.27   | \$7.70 | \$13.60 | \$0.00                       | \$59.57    |
|   | 06/01/2021     | \$39.19   | \$7.70 | \$13.60 | \$0.00                       | \$60.49    |
|   | 12/01/2021     | \$40.10   | \$7.70 | \$13.60 | \$0.00                       | \$61.40    |
| For apprentice rates see "Apprentice- LABORER"                            |                |           |        |         |                              |            |
| CARPENTER<br><i>CARPENTERS -ZONE 2 (Eastern Massachusetts)</i>            | 03/01/2018     | \$40.28   | \$9.90 | \$17.50 | \$0.00                       | \$67.68    |
|   | 09/01/2018     | \$41.32   | \$9.90 | \$17.50 | \$0.00                       | \$68.72    |
|   | 03/01/2019     | \$42.35   | \$9.90 | \$17.50 | \$0.00                       | \$69.75    |

**Classification**
**Effective Date**
**Base Wage**
**Health**
**Pension**
**Supplemental  
Unemployment**
**Total Rate**
**Apprentice - CARPENTER - Zone 2 Eastern MA**
**Effective Date - 03/01/2018**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 50      | \$20.14              | \$9.90 | \$1.73  | \$0.00                       | \$31.77    |
| 2    | 60      | \$24.17              | \$9.90 | \$1.73  | \$0.00                       | \$35.80    |
| 3    | 70      | \$28.20              | \$9.90 | \$12.31 | \$0.00                       | \$50.41    |
| 4    | 75      | \$30.21              | \$9.90 | \$12.31 | \$0.00                       | \$52.42    |
| 5    | 80      | \$32.22              | \$9.90 | \$14.04 | \$0.00                       | \$56.16    |
| 6    | 80      | \$32.22              | \$9.90 | \$14.04 | \$0.00                       | \$56.16    |
| 7    | 90      | \$36.25              | \$9.90 | \$15.77 | \$0.00                       | \$61.92    |
| 8    | 90      | \$36.25              | \$9.90 | \$15.77 | \$0.00                       | \$61.92    |

**Effective Date - 09/01/2018**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 50      | \$20.66              | \$9.90 | \$1.73  | \$0.00                       | \$32.29    |
| 2    | 60      | \$24.79              | \$9.90 | \$1.73  | \$0.00                       | \$36.42    |
| 3    | 70      | \$28.92              | \$9.90 | \$12.31 | \$0.00                       | \$51.13    |
| 4    | 75      | \$30.99              | \$9.90 | \$12.31 | \$0.00                       | \$53.20    |
| 5    | 80      | \$33.06              | \$9.90 | \$14.04 | \$0.00                       | \$57.00    |
| 6    | 80      | \$33.06              | \$9.90 | \$14.04 | \$0.00                       | \$57.00    |
| 7    | 90      | \$37.19              | \$9.90 | \$15.77 | \$0.00                       | \$62.86    |
| 8    | 90      | \$37.19              | \$9.90 | \$15.77 | \$0.00                       | \$62.86    |

**Notes:**

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80  
Step 1&2 \$29.76/ 3&4 \$35.45/ 5&6 \$52.14/ 7&8 \$57.89

**Apprentice to Journeyworker Ratio:1:5**

|                                 |            |         |        |        |        |         |
|---------------------------------|------------|---------|--------|--------|--------|---------|
| CARPENTER WOOD FRAME            | 04/01/2018 | \$26.67 | \$7.07 | \$7.86 | \$0.00 | \$41.60 |
| CARPENTERS -ZONE 2 (Wood Frame) | 10/01/2018 | \$27.09 | \$7.07 | \$7.86 | \$0.00 | \$42.02 |
|                                 | 04/01/2019 | \$27.52 | \$7.07 | \$7.86 | \$0.00 | \$42.45 |
|                                 | 10/01/2019 | \$27.95 | \$7.07 | \$7.86 | \$0.00 | \$42.88 |

As of 9/1/09 Carpentry work on wood-frame WEATHERIZATION projects shall be paid the WOOD FRAME CARPENTER rate.

**Classification**
**Effective Date**
**Base Wage**
**Health**
**Pension**
**Supplemental  
Unemployment**
**Total Rate**
**Apprentice - CARPENTER (Wood Frame) - Zone 2**
**Effective Date - 04/01/2018**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 60      | \$16.00              | \$7.07 | \$0.00  | \$0.00                       | \$23.07    |
| 2    | 60      | \$16.00              | \$7.07 | \$0.00  | \$0.00                       | \$23.07    |
| 3    | 65      | \$17.34              | \$7.07 | \$7.86  | \$0.00                       | \$32.27    |
| 4    | 70      | \$18.67              | \$7.07 | \$7.86  | \$0.00                       | \$33.60    |
| 5    | 75      | \$20.00              | \$7.07 | \$7.86  | \$0.00                       | \$34.93    |
| 6    | 80      | \$21.34              | \$7.07 | \$7.86  | \$0.00                       | \$36.27    |
| 7    | 85      | \$22.67              | \$7.07 | \$7.86  | \$0.00                       | \$37.60    |
| 8    | 90      | \$24.00              | \$7.07 | \$7.86  | \$0.00                       | \$38.93    |

**Effective Date - 10/01/2018**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 60      | \$16.25              | \$7.07 | \$0.00  | \$0.00                       | \$23.32    |
| 2    | 60      | \$16.25              | \$7.07 | \$0.00  | \$0.00                       | \$23.32    |
| 3    | 65      | \$17.61              | \$7.07 | \$7.86  | \$0.00                       | \$32.54    |
| 4    | 70      | \$18.96              | \$7.07 | \$7.86  | \$0.00                       | \$33.89    |
| 5    | 75      | \$20.32              | \$7.07 | \$7.86  | \$0.00                       | \$35.25    |
| 6    | 80      | \$21.67              | \$7.07 | \$7.86  | \$0.00                       | \$36.60    |
| 7    | 85      | \$23.03              | \$7.07 | \$7.86  | \$0.00                       | \$37.96    |
| 8    | 90      | \$24.38              | \$7.07 | \$7.86  | \$0.00                       | \$39.31    |

**Notes:**

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80  
Step 1&2 \$19.07/ 3&4 \$26.49/ 5&6 \$33.60/ 7&8 \$36.27

**Apprentice to Journeyworker Ratio:1:5**

|  |            |         |         |         |        |         |
|--|------------|---------|---------|---------|--------|---------|
| CARPENTER WOOD FRAME (All Other Work)<br>CARPENTERS -ZONE 2 (Wood Frame) | 06/01/2016 | \$25.32 | \$9.80  | \$16.82 | \$0.00 | \$51.94 |
| CEMENT MASONRY/PLASTERING<br>BRICKLAYERS LOCAL 3 (WORCESTER)             | 01/01/2018 | \$43.61 | \$12.35 | \$22.41 | \$0.30 | \$78.67 |
|  | 07/01/2018 | \$44.35 | \$12.35 | \$22.41 | \$0.30 | \$79.41 |
|  | 01/01/2019 | \$45.77 | \$12.35 | \$22.41 | \$0.30 | \$80.83 |
|  | 07/01/2019 | \$46.45 | \$12.35 | \$22.41 | \$0.30 | \$81.51 |
|  | 01/01/2020 | \$47.86 | \$12.35 | \$22.41 | \$0.30 | \$82.92 |

**Classification**
**Effective Date**
**Base Wage**
**Health**
**Pension**
**Supplemental  
Unemployment**
**Total Rate**
**Apprentice - CEMENT MASONRY/PLASTERING - Worcester**
**Effective Date - 01/01/2018**

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|------------------------------|------------|
| 1    | 50      | \$21.81              | \$12.35 | \$15.41 | \$0.00                       | \$49.57    |
| 2    | 60      | \$26.17              | \$12.35 | \$17.41 | \$0.30                       | \$56.23    |
| 3    | 65      | \$28.35              | \$12.35 | \$18.41 | \$0.30                       | \$59.41    |
| 4    | 70      | \$30.53              | \$12.35 | \$19.41 | \$0.30                       | \$62.59    |
| 5    | 75      | \$32.71              | \$12.35 | \$20.41 | \$0.30                       | \$65.77    |
| 6    | 80      | \$34.89              | \$12.35 | \$21.41 | \$0.30                       | \$68.95    |
| 7    | 90      | \$39.25              | \$12.35 | \$22.41 | \$0.30                       | \$74.31    |

**Effective Date - 07/01/2018**

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|------------------------------|------------|
| 1    | 50      | \$22.18              | \$12.35 | \$15.41 | \$0.00                       | \$49.94    |
| 2    | 60      | \$26.61              | \$12.35 | \$17.41 | \$0.30                       | \$56.67    |
| 3    | 65      | \$28.83              | \$12.35 | \$18.41 | \$0.30                       | \$59.89    |
| 4    | 70      | \$31.05              | \$12.35 | \$19.41 | \$0.30                       | \$63.11    |
| 5    | 75      | \$33.26              | \$12.35 | \$20.41 | \$0.30                       | \$66.32    |
| 6    | 80      | \$35.48              | \$12.35 | \$21.41 | \$0.30                       | \$69.54    |
| 7    | 90      | \$39.92              | \$12.35 | \$22.41 | \$0.30                       | \$74.98    |

**Notes:**

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

**Apprentice to Journeyworker Ratio:1:3**

|  |            |         |         |         |        |         |
|--|------------|---------|---------|---------|--------|---------|
| CHAIN SAW OPERATOR   | 12/01/2017 | \$33.08 | \$7.70  | \$13.60 | \$0.00 | \$54.38 |
| LABORERS - ZONE 2  | 06/01/2018 | \$33.92 | \$7.70  | \$13.60 | \$0.00 | \$55.22 |
|  | 12/01/2018 | \$34.76 | \$7.70  | \$13.60 | \$0.00 | \$56.06 |
|  | 06/01/2019 | \$35.63 | \$7.70  | \$13.60 | \$0.00 | \$56.93 |
|  | 12/01/2019 | \$36.49 | \$7.70  | \$13.60 | \$0.00 | \$57.79 |
|  | 06/01/2020 | \$37.38 | \$7.70  | \$13.60 | \$0.00 | \$58.68 |
|  | 12/01/2020 | \$38.27 | \$7.70  | \$13.60 | \$0.00 | \$59.57 |
|  | 06/01/2021 | \$39.19 | \$7.70  | \$13.60 | \$0.00 | \$60.49 |
|  | 12/01/2021 | \$40.10 | \$7.70  | \$13.60 | \$0.00 | \$61.40 |
| For apprentice rates see "Apprentice- LABORER"             |            |         |         |         |        |         |
| CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES                | 12/01/2017 | \$47.63 | \$10.50 | \$15.50 | \$0.00 | \$73.63 |
| OPERATING ENGINEERS LOCAL 4                                |            |         |         |         |        |         |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" |            |         |         |         |        |         |
| COMPRESSOR OPERATOR  | 12/01/2017 | \$31.80 | \$10.50 | \$15.50 | \$0.00 | \$57.80 |
| OPERATING ENGINEERS LOCAL 4                                |            |         |         |         |        |         |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" |            |         |         |         |        |         |
| DELEADER (BRIDGE)  | 01/01/2017 | \$51.41 | \$7.85  | \$16.10 | \$0.00 | \$75.36 |
| PAINTERS LOCAL 35 - ZONE 2                                 |            |         |         |         |        |         |



**Apprentice - PAINTER Local 35 - BRIDGES/TANKS**

**Effective Date - 01/01/2017**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 50      | \$25.71              | \$7.85 | \$0.00  | \$0.00                       | \$33.56    |
| 2    | 55      | \$28.28              | \$7.85 | \$3.66  | \$0.00                       | \$39.79    |
| 3    | 60      | \$30.85              | \$7.85 | \$3.99  | \$0.00                       | \$42.69    |
| 4    | 65      | \$33.42              | \$7.85 | \$4.32  | \$0.00                       | \$45.59    |
| 5    | 70      | \$35.99              | \$7.85 | \$14.11 | \$0.00                       | \$57.95    |
| 6    | 75      | \$38.56              | \$7.85 | \$14.44 | \$0.00                       | \$60.85    |
| 7    | 80      | \$41.13              | \$7.85 | \$14.77 | \$0.00                       | \$63.75    |
| 8    | 90      | \$46.27              | \$7.85 | \$15.44 | \$0.00                       | \$69.56    |

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

|   |            |         |        |         |        |         |
|---|------------|---------|--------|---------|--------|---------|
| DEMO: ADZEMAN<br>LABORERS - ZONE 2                        | 12/01/2017 | \$37.65 | \$7.70 | \$14.75 | \$0.00 | \$60.10 |
|   | 06/01/2018 | \$38.60 | \$7.70 | \$14.75 | \$0.00 | \$61.05 |
|   | 12/01/2018 | \$39.55 | \$7.70 | \$14.75 | \$0.00 | \$62.00 |
|   | 06/01/2019 | \$40.55 | \$7.70 | \$14.75 | \$0.00 | \$63.00 |
|   | 12/01/2019 | \$41.55 | \$7.70 | \$14.75 | \$0.00 | \$64.00 |
| For apprentice rates see "Apprentice- LABORER"            |            |         |        |         |        |         |
| DEMO: BACKHOE/LOADER/HAMMER OPERATOR<br>LABORERS - ZONE 2 | 12/01/2017 | \$38.65 | \$7.70 | \$14.75 | \$0.00 | \$61.10 |
|   | 06/01/2018 | \$39.60 | \$7.70 | \$14.75 | \$0.00 | \$62.05 |
|   | 12/01/2018 | \$40.55 | \$7.70 | \$14.75 | \$0.00 | \$63.00 |
|   | 06/01/2019 | \$41.55 | \$7.70 | \$14.75 | \$0.00 | \$64.00 |
|   | 12/01/2019 | \$42.55 | \$7.70 | \$14.75 | \$0.00 | \$65.00 |
| For apprentice rates see "Apprentice- LABORER"            |            |         |        |         |        |         |
| DEMO: BURNERS<br>LABORERS - ZONE 2                        | 12/01/2017 | \$38.40 | \$7.70 | \$14.75 | \$0.00 | \$60.85 |
|   | 06/01/2018 | \$39.35 | \$7.70 | \$14.75 | \$0.00 | \$61.80 |
|   | 12/01/2018 | \$40.30 | \$7.70 | \$14.75 | \$0.00 | \$62.75 |
|   | 06/01/2019 | \$41.30 | \$7.70 | \$14.75 | \$0.00 | \$63.75 |
|   | 12/01/2019 | \$42.30 | \$7.70 | \$14.75 | \$0.00 | \$64.75 |
| For apprentice rates see "Apprentice- LABORER"            |            |         |        |         |        |         |
| DEMO: CONCRETE CUTTER/SAWYER<br>LABORERS - ZONE 2         | 12/01/2017 | \$38.65 | \$7.70 | \$14.75 | \$0.00 | \$61.10 |
|   | 06/01/2018 | \$39.60 | \$7.70 | \$14.75 | \$0.00 | \$62.05 |
|   | 12/01/2018 | \$40.55 | \$7.70 | \$14.75 | \$0.00 | \$63.00 |
|   | 06/01/2019 | \$41.55 | \$7.70 | \$14.75 | \$0.00 | \$64.00 |
|   | 12/01/2019 | \$42.55 | \$7.70 | \$14.75 | \$0.00 | \$65.00 |
| For apprentice rates see "Apprentice- LABORER"            |            |         |        |         |        |         |
| DEMO: JACKHAMMER OPERATOR<br>LABORERS - ZONE 2            | 12/01/2017 | \$38.40 | \$7.70 | \$14.75 | \$0.00 | \$60.85 |
|   | 06/01/2018 | \$39.35 | \$7.70 | \$14.75 | \$0.00 | \$61.80 |
|   | 12/01/2018 | \$40.30 | \$7.70 | \$14.75 | \$0.00 | \$62.75 |
|   | 06/01/2019 | \$41.30 | \$7.70 | \$14.75 | \$0.00 | \$63.75 |
|   | 12/01/2019 | \$42.30 | \$7.70 | \$14.75 | \$0.00 | \$64.75 |

| Classification   | Effective Date | Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|------------|
| For apprentice rates see "Apprentice- LABORER"             |                |           |         |         |                              |            |
| DEMO: WRECKING LABORER                                     | 12/01/2017     | \$37.65   | \$7.70  | \$14.75 | \$0.00                       | \$60.10    |
| LABORERS - ZONE 2  | 06/01/2018     | \$38.60   | \$7.70  | \$14.75 | \$0.00                       | \$61.05    |
|  | 12/01/2018     | \$39.55   | \$7.70  | \$14.75 | \$0.00                       | \$62.00    |
|  | 06/01/2019     | \$40.55   | \$7.70  | \$14.75 | \$0.00                       | \$63.00    |
|  | 12/01/2019     | \$41.55   | \$7.70  | \$14.75 | \$0.00                       | \$64.00    |
| For apprentice rates see "Apprentice- LABORER"             |                |           |         |         |                              |            |
| DIRECTIONAL DRILL MACHINE OPERATOR                         | 12/01/2017     | \$46.17   | \$10.50 | \$15.50 | \$0.00                       | \$72.17    |
| OPERATING ENGINEERS LOCAL 4                                |                |           |         |         |                              |            |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" |                |           |         |         |                              |            |
| DIVER  | 08/01/2017     | \$61.98   | \$9.90  | \$21.15 | \$0.00                       | \$93.03    |
| PILE DRIVER LOCAL 56 (ZONE 2)                              | 08/01/2018     | \$65.20   | \$9.90  | \$21.15 | \$0.00                       | \$96.25    |
|  | 08/01/2019     | \$68.52   | \$9.90  | \$21.15 | \$0.00                       | \$99.57    |
| For apprentice rates see "Apprentice- PILE DRIVER"         |                |           |         |         |                              |            |
| DIVER TENDER   | 08/01/2017     | \$44.27   | \$9.90  | \$21.15 | \$0.00                       | \$75.32    |
| PILE DRIVER LOCAL 56 (ZONE 2)                              | 08/01/2018     | \$46.57   | \$9.90  | \$21.15 | \$0.00                       | \$77.62    |
|  | 08/01/2019     | \$48.94   | \$9.90  | \$21.15 | \$0.00                       | \$79.99    |
| For apprentice rates see "Apprentice- PILE DRIVER"         |                |           |         |         |                              |            |
| DIVER TENDER (EFFLUENT)                                    | 08/01/2017     | \$66.41   | \$9.90  | \$21.15 | \$0.00                       | \$97.46    |
| PILE DRIVER LOCAL 56 (ZONE 2)                              | 08/01/2018     | \$69.86   | \$9.90  | \$21.15 | \$0.00                       | \$100.91   |
|  | 08/01/2019     | \$73.41   | \$9.90  | \$21.15 | \$0.00                       | \$104.46   |
| For apprentice rates see "Apprentice- PILE DRIVER"         |                |           |         |         |                              |            |
| DIVER/SLURRY (EFFLUENT)                                    | 08/01/2017     | \$92.97   | \$9.90  | \$21.15 | \$0.00                       | \$124.02   |
| PILE DRIVER LOCAL 56 (ZONE 2)                              | 08/01/2018     | \$97.80   | \$9.90  | \$21.15 | \$0.00                       | \$128.85   |
|  | 08/01/2019     | \$102.78  | \$9.90  | \$21.15 | \$0.00                       | \$133.83   |
| For apprentice rates see "Apprentice- PILE DRIVER"         |                |           |         |         |                              |            |
| ELECTRICIAN  | 12/01/2017     | \$42.32   | \$9.57  | \$14.60 | \$0.00                       | \$66.49    |
| ELECTRICIANS LOCAL 96                                      | 06/01/2018     | \$43.27   | \$9.82  | \$14.98 | \$0.00                       | \$68.07    |
|  | 12/01/2018     | \$43.52   | \$10.07 | \$15.02 | \$0.00                       | \$68.61    |
|  | 06/01/2019     | \$45.52   | \$10.07 | \$15.30 | \$0.00                       | \$70.89    |

**Classification**

**Effective Date   Base Wage   Health   Pension   Supplemental Unemployment   Total Rate**

**Apprentice - ELECTRICIAN - Local 96**
**Effective Date - 12/01/2017**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 40      | \$16.93              | \$9.57 | \$0.51  | \$0.00                    | \$27.01    |
| 2    | 43      | \$18.20              | \$9.57 | \$0.55  | \$0.00                    | \$28.32    |
| 3    | 48      | \$20.31              | \$9.57 | \$11.51 | \$0.00                    | \$41.39    |
| 4    | 55      | \$23.28              | \$9.57 | \$11.93 | \$0.00                    | \$44.78    |
| 5    | 65      | \$27.51              | \$9.57 | \$12.53 | \$0.00                    | \$49.61    |
| 6    | 80      | \$33.86              | \$9.57 | \$13.41 | \$0.00                    | \$56.84    |

**Effective Date - 06/01/2018**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 40      | \$17.31              | \$9.82 | \$0.52  | \$0.00                    | \$27.65    |
| 2    | 43      | \$18.61              | \$9.82 | \$0.56  | \$0.00                    | \$28.99    |
| 3    | 48      | \$20.77              | \$9.82 | \$11.82 | \$0.00                    | \$42.41    |
| 4    | 55      | \$23.80              | \$9.82 | \$12.25 | \$0.00                    | \$45.87    |
| 5    | 65      | \$28.13              | \$9.82 | \$12.85 | \$0.00                    | \$50.80    |
| 6    | 80      | \$34.62              | \$9.82 | \$13.77 | \$0.00                    | \$58.21    |

**Notes:**

Steps 1-2 are 1000 hrs; Steps 3-6 are 1500 hrs.

**Apprentice to Journeyworker Ratio:2:3\*\*\***

|                                |            |         |         |         |        |         |
|--------------------------------|------------|---------|---------|---------|--------|---------|
| ELEVATOR CONSTRUCTOR           | 01/01/2017 | \$49.90 | \$15.28 | \$15.71 | \$0.00 | \$80.89 |
| ELEVATOR CONSTRUCTORS LOCAL 41 |            |         |         |         |        |         |

**Apprentice - ELEVATOR CONSTRUCTOR - Local 41**
**Effective Date - 01/01/2017**

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$24.95              | \$15.28 | \$15.71 | \$0.00                    | \$55.94    |
| 2    | 55      | \$27.45              | \$15.28 | \$15.71 | \$0.00                    | \$58.44    |
| 3    | 65      | \$32.44              | \$15.28 | \$15.71 | \$0.00                    | \$63.43    |
| 4    | 70      | \$34.93              | \$15.28 | \$15.71 | \$0.00                    | \$65.92    |
| 5    | 80      | \$39.92              | \$15.28 | \$15.71 | \$0.00                    | \$70.91    |

**Notes:**

Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

**Apprentice to Journeyworker Ratio:1:1**

|                                |            |         |         |         |        |         |
|--------------------------------|------------|---------|---------|---------|--------|---------|
| ELEVATOR CONSTRUCTOR HELPER    | 01/01/2017 | \$34.93 | \$15.28 | \$15.71 | \$0.00 | \$65.92 |
| ELEVATOR CONSTRUCTORS LOCAL 41 |            |         |         |         |        |         |

For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

| Classification  | Effective Date | Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|---|----------------|-----------|---------|---------|------------------------------|------------|
| FENCE & GUARD RAIL ERECTOR<br><i>LABORERS - ZONE 2</i>                        | 12/01/2017     | \$33.08   | \$7.70  | \$13.60 | \$0.00                       | \$54.38    |
|   | 06/01/2018     | \$33.92   | \$7.70  | \$13.60 | \$0.00                       | \$55.22    |
|   | 12/01/2018     | \$34.76   | \$7.70  | \$13.60 | \$0.00                       | \$56.06    |
|   | 06/01/2019     | \$35.63   | \$7.70  | \$13.60 | \$0.00                       | \$56.93    |
|   | 12/01/2019     | \$36.49   | \$7.70  | \$13.60 | \$0.00                       | \$57.79    |
|   | 06/01/2020     | \$37.38   | \$7.70  | \$13.60 | \$0.00                       | \$58.68    |
|   | 12/01/2020     | \$38.27   | \$7.70  | \$13.60 | \$0.00                       | \$59.57    |
|   | 06/01/2021     | \$39.19   | \$7.70  | \$13.60 | \$0.00                       | \$60.49    |
|   | 12/01/2021     | \$40.10   | \$7.70  | \$13.60 | \$0.00                       | \$61.40    |
| For apprentice rates see "Apprentice- LABORER"                                |                |           |         |         |                              |            |
| FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY<br><i>OPERATING ENGINEERS LOCAL 4</i> | 11/01/2017     | \$42.88   | \$10.00 | \$15.25 | \$0.00                       | \$68.13    |
|   | 05/01/2018     | \$43.59   | \$10.00 | \$15.25 | \$0.00                       | \$68.84    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                    |                |           |         |         |                              |            |
| FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY<br><i>OPERATING ENGINEERS LOCAL 4</i> | 11/01/2017     | \$44.34   | \$10.00 | \$15.25 | \$0.00                       | \$69.59    |
|   | 05/01/2018     | \$45.06   | \$10.00 | \$15.25 | \$0.00                       | \$70.31    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                    |                |           |         |         |                              |            |
| FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY<br><i>OPERATING ENGINEERS LOCAL 4</i>  | 11/01/2017     | \$22.83   | \$10.00 | \$15.25 | \$0.00                       | \$48.08    |
|   | 05/01/2018     | \$23.26   | \$10.00 | \$15.25 | \$0.00                       | \$48.51    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                    |                |           |         |         |                              |            |
| FIRE ALARM INSTALLER<br><i>ELECTRICIANS LOCAL 96</i>                          | 12/01/2017     | \$42.32   | \$9.57  | \$14.60 | \$0.00                       | \$66.49    |
|   | 06/01/2018     | \$43.27   | \$9.82  | \$14.98 | \$0.00                       | \$68.07    |
|   | 12/01/2018     | \$43.52   | \$10.07 | \$15.02 | \$0.00                       | \$68.61    |
|   | 06/01/2019     | \$45.52   | \$10.07 | \$15.30 | \$0.00                       | \$70.89    |
| For apprentice rates see "Apprentice- ELECTRICIAN"                            |                |           |         |         |                              |            |
| FIRE ALARM REPAIR / MAINT/COMMISSIONING<br><i>ELECTRICIANS LOCAL 96</i>       | 12/01/2017     | \$42.32   | \$9.57  | \$14.60 | \$0.00                       | \$66.49    |
|   | 06/01/2018     | \$43.27   | \$9.82  | \$14.98 | \$0.00                       | \$68.07    |
|   | 12/01/2018     | \$43.52   | \$10.07 | \$15.02 | \$0.00                       | \$68.61    |
|   | 06/01/2019     | \$45.52   | \$10.07 | \$15.30 | \$0.00                       | \$70.89    |
| For apprentice rates see "Apprentice- ELECTRICIAN"                            |                |           |         |         |                              |            |
| FIREMAN (ASST. ENGINEER)<br><i>OPERATING ENGINEERS LOCAL 4</i>                | 12/01/2017     | \$38.57   | \$10.50 | \$15.50 | \$0.00                       | \$64.57    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                    |                |           |         |         |                              |            |
| FLAGGER & SIGNALER<br><i>LABORERS - ZONE 2</i>                                | 12/01/2017     | \$21.50   | \$7.70  | \$13.60 | \$0.00                       | \$42.80    |
|   | 06/01/2018     | \$21.50   | \$7.70  | \$13.60 | \$0.00                       | \$42.80    |
|   | 12/01/2018     | \$22.50   | \$7.70  | \$13.60 | \$0.00                       | \$43.80    |
|   | 06/01/2019     | \$22.50   | \$7.70  | \$13.60 | \$0.00                       | \$43.80    |
|   | 12/01/2019     | \$23.50   | \$7.70  | \$13.60 | \$0.00                       | \$44.80    |
|   | 06/01/2020     | \$23.50   | \$7.70  | \$13.60 | \$0.00                       | \$44.80    |
|   | 12/01/2020     | \$24.50   | \$7.70  | \$13.60 | \$0.00                       | \$45.80    |
|   | 06/01/2021     | \$24.50   | \$7.70  | \$13.60 | \$0.00                       | \$45.80    |
|   | 12/01/2021     | \$24.50   | \$7.70  | \$13.60 | \$0.00                       | \$45.80    |
| For apprentice rates see "Apprentice- LABORER"                                |                |           |         |         |                              |            |
| FLOORCOVERER<br><i>FLOORCOVERERS LOCAL 2168 ZONE II</i>                       | 03/01/2016     | \$39.82   | \$9.80  | \$17.62 | \$0.00                       | \$67.24    |

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|----------------|----------------|-----------|--------|---------|---------------------------|------------|
|----------------|----------------|-----------|--------|---------|---------------------------|------------|

**Apprentice - FLOORCOVERER - Local 2168 Zone II**

**Effective Date -** 03/01/2016

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$19.91              | \$9.80 | \$1.79  | \$0.00                    | \$31.50    |
| 2    | 55      | \$21.90              | \$9.80 | \$1.79  | \$0.00                    | \$33.49    |
| 3    | 60      | \$23.89              | \$9.80 | \$12.25 | \$0.00                    | \$45.94    |
| 4    | 65      | \$25.88              | \$9.80 | \$12.25 | \$0.00                    | \$47.93    |
| 5    | 70      | \$27.87              | \$9.80 | \$14.04 | \$0.00                    | \$51.71    |
| 6    | 75      | \$29.87              | \$9.80 | \$14.04 | \$0.00                    | \$53.71    |
| 7    | 80      | \$31.86              | \$9.80 | \$15.83 | \$0.00                    | \$57.49    |
| 8    | 85      | \$33.85              | \$9.80 | \$15.83 | \$0.00                    | \$59.48    |

**Notes:** Steps are 750 hrs.  
 % After 09/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)  
 Step 1&2 \$29.51/ 3&4 \$35.22/ 5&6 \$51.71/ 7&8 \$57.49

**Apprentice to Journeyworker Ratio:1:1**

|  |            |         |         |         |        |         |
|--|------------|---------|---------|---------|--------|---------|
| FORK LIFT/CHERRY PICKER<br>OPERATING ENGINEERS LOCAL 4 | 12/01/2017 | \$46.63 | \$10.50 | \$15.50 | \$0.00 | \$72.63 |
|--|------------|---------|---------|---------|--------|---------|

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| GENERATOR/LIGHTING PLANT/HEATERS<br>OPERATING ENGINEERS LOCAL 4 | 12/01/2017 | \$31.80 | \$10.50 | \$15.50 | \$0.00 | \$57.80 |
|---|------------|---------|---------|---------|--------|---------|

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

|  |            |         |        |         |        |         |
|--|------------|---------|--------|---------|--------|---------|
| GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)<br>GLAZIERS LOCAL 35 (ZONE 2) | 01/01/2017 | \$40.91 | \$7.85 | \$16.10 | \$0.00 | \$64.86 |
|--|------------|---------|--------|---------|--------|---------|

**Apprentice - GLAZIER - Local 35 Zone 2**

**Effective Date -** 01/01/2017

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$20.46              | \$7.85 | \$0.00  | \$0.00                    | \$28.31    |
| 2    | 55      | \$22.50              | \$7.85 | \$3.66  | \$0.00                    | \$34.01    |
| 3    | 60      | \$24.55              | \$7.85 | \$3.99  | \$0.00                    | \$36.39    |
| 4    | 65      | \$26.59              | \$7.85 | \$4.32  | \$0.00                    | \$38.76    |
| 5    | 70      | \$28.64              | \$7.85 | \$14.11 | \$0.00                    | \$50.60    |
| 6    | 75      | \$30.68              | \$7.85 | \$14.44 | \$0.00                    | \$52.97    |
| 7    | 80      | \$32.73              | \$7.85 | \$14.77 | \$0.00                    | \$55.35    |
| 8    | 90      | \$36.82              | \$7.85 | \$15.44 | \$0.00                    | \$60.11    |

**Notes:**  
 Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

|  |            |         |         |         |        |         |
|--|------------|---------|---------|---------|--------|---------|
| HOISTING ENGINEER/CRANES/GRADALLS<br>OPERATING ENGINEERS LOCAL 4 | 12/01/2017 | \$46.63 | \$10.50 | \$15.50 | \$0.00 | \$72.63 |
|--|------------|---------|---------|---------|--------|---------|

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|----------------|----------------|-----------|--------|---------|---------------------------|------------|
|----------------|----------------|-----------|--------|---------|---------------------------|------------|

**Apprentice - OPERATING ENGINEERS - Local 4**

**Effective Date - 12/01/2017**

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 55      | \$25.65              | \$10.50 | \$0.00  | \$0.00                    | \$36.15    |
| 2    | 60      | \$27.98              | \$10.50 | \$15.50 | \$0.00                    | \$53.98    |
| 3    | 65      | \$30.31              | \$10.50 | \$15.50 | \$0.00                    | \$56.31    |
| 4    | 70      | \$32.64              | \$10.50 | \$15.50 | \$0.00                    | \$58.64    |
| 5    | 75      | \$34.97              | \$10.50 | \$15.50 | \$0.00                    | \$60.97    |
| 6    | 80      | \$37.30              | \$10.50 | \$15.50 | \$0.00                    | \$63.30    |
| 7    | 85      | \$39.64              | \$10.50 | \$15.50 | \$0.00                    | \$65.64    |
| 8    | 90      | \$41.97              | \$10.50 | \$15.50 | \$0.00                    | \$67.97    |

**Notes:**

**Apprentice to Journeyworker Ratio:1:6**

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| HVAC (DUCTWORK)<br><i>SHEETMETAL WORKERS LOCAL 63</i>                     | 01/01/2018 | \$32.99 | \$10.64 | \$16.22 | \$1.77 | \$61.62 |
|   | 07/01/2018 | \$33.74 | \$10.64 | \$16.22 | \$1.77 | \$62.37 |
|   | 01/01/2019 | \$34.74 | \$10.64 | \$16.22 | \$1.77 | \$63.37 |
|   | 07/01/2019 | \$35.74 | \$10.64 | \$16.22 | \$1.77 | \$64.37 |
|   | 01/01/2020 | \$36.99 | \$10.64 | \$16.22 | \$1.77 | \$65.62 |
| For apprentice rates see "Apprentice- SHEET METAL WORKER"                 |            |         |         |         |        |         |
| HVAC (ELECTRICAL CONTROLS)<br><i>ELECTRICIANS LOCAL 96</i>                | 12/01/2017 | \$42.32 | \$9.57  | \$14.60 | \$0.00 | \$66.49 |
|   | 06/01/2018 | \$43.27 | \$9.82  | \$14.98 | \$0.00 | \$68.07 |
|   | 12/01/2018 | \$43.52 | \$10.07 | \$15.02 | \$0.00 | \$68.61 |
|   | 06/01/2019 | \$45.52 | \$10.07 | \$15.30 | \$0.00 | \$70.89 |
| For apprentice rates see "Apprentice- ELECTRICIAN"                        |            |         |         |         |        |         |
| HVAC (TESTING AND BALANCING - AIR)<br><i>SHEETMETAL WORKERS LOCAL 63</i>  | 01/01/2018 | \$32.99 | \$10.64 | \$16.22 | \$1.77 | \$61.62 |
|   | 07/01/2018 | \$33.74 | \$10.64 | \$16.22 | \$1.77 | \$62.37 |
|   | 01/01/2019 | \$34.74 | \$10.64 | \$16.22 | \$1.77 | \$63.37 |
|   | 07/01/2019 | \$35.74 | \$10.64 | \$16.22 | \$1.77 | \$64.37 |
|   | 01/01/2020 | \$36.99 | \$10.64 | \$16.22 | \$1.77 | \$65.62 |
| For apprentice rates see "Apprentice- SHEET METAL WORKER"                 |            |         |         |         |        |         |
| HVAC (TESTING AND BALANCING -WATER)<br><i>PLUMBERS LOCAL 4</i>            | 03/01/2018 | \$43.96 | \$9.35  | \$14.91 | \$0.00 | \$68.22 |
| For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER" |            |         |         |         |        |         |
| HVAC MECHANIC<br><i>PLUMBERS LOCAL 4</i>                                  | 03/01/2018 | \$43.96 | \$9.35  | \$14.91 | \$0.00 | \$68.22 |
| For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER" |            |         |         |         |        |         |

| Classification                               | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|--------|---------|---------------------------|------------|
| HYDRAULIC DRILLS<br><i>LABORERS - ZONE 2</i> | 12/01/2017     | \$33.58   | \$7.70 | \$13.60 | \$0.00                    | \$54.88    |
|  | 06/01/2018     | \$34.42   | \$7.70 | \$13.60 | \$0.00                    | \$55.72    |
|  | 12/01/2018     | \$35.26   | \$7.70 | \$13.60 | \$0.00                    | \$56.56    |
|  | 06/01/2019     | \$36.13   | \$7.70 | \$13.60 | \$0.00                    | \$57.43    |
|  | 12/01/2019     | \$36.99   | \$7.70 | \$13.60 | \$0.00                    | \$58.29    |
|  | 06/01/2020     | \$37.88   | \$7.70 | \$13.60 | \$0.00                    | \$59.18    |
|  | 12/01/2020     | \$38.77   | \$7.70 | \$13.60 | \$0.00                    | \$60.07    |
|  | 06/01/2021     | \$39.69   | \$7.70 | \$13.60 | \$0.00                    | \$60.99    |
|  | 12/01/2021     | \$40.60   | \$7.70 | \$13.60 | \$0.00                    | \$61.90    |

For apprentice rates see "Apprentice- LABORER"

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| INSULATOR (PIPES & TANKS)<br><i>HEAT &amp; FROST INSULATORS LOCAL 6 (WORCESTER)</i> | 09/01/2017 | \$42.38 | \$11.75 | \$14.20 | \$0.00 | \$68.33 |
|   | 09/01/2018 | \$44.40 | \$11.75 | \$14.20 | \$0.00 | \$70.35 |
|   | 09/01/2019 | \$46.65 | \$11.75 | \$14.20 | \$0.00 | \$72.60 |

**Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Worcester**

**Effective Date -** 09/01/2017

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$21.19              | \$11.75 | \$10.45 | \$0.00                    | \$43.39    |
| 2    | 60      | \$25.43              | \$11.75 | \$11.20 | \$0.00                    | \$48.38    |
| 3    | 70      | \$29.67              | \$11.75 | \$11.95 | \$0.00                    | \$53.37    |
| 4    | 80      | \$33.90              | \$11.75 | \$12.70 | \$0.00                    | \$58.35    |

**Effective Date -** 09/01/2018

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$22.20              | \$11.75 | \$10.45 | \$0.00                    | \$44.40    |
| 2    | 60      | \$26.64              | \$11.75 | \$11.20 | \$0.00                    | \$49.59    |
| 3    | 70      | \$31.08              | \$11.75 | \$11.95 | \$0.00                    | \$54.78    |
| 4    | 80      | \$35.52              | \$11.75 | \$12.70 | \$0.00                    | \$59.97    |

**Notes:**

Steps are 1 year

**Apprentice to Journeyworker Ratio:1:4**

|  |            |         |        |         |        |         |
|--|------------|---------|--------|---------|--------|---------|
| IRONWORKER/WELDER<br><i>IRONWORKERS LOCAL 7 (WORCESTER AREA)</i> | 03/16/2017 | \$44.35 | \$7.80 | \$20.85 | \$0.00 | \$73.00 |
|--|------------|---------|--------|---------|--------|---------|

**Classification**

**Effective Date    Base Wage    Health    Pension    Supplemental  
Unemployment    Total Rate**

**Apprentice - IRONWORKER - Local 7 Worcester**

**Effective Date - 03/16/2017**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 60      | \$26.61              | \$7.80 | \$20.85 | \$0.00                       | \$55.26    |
| 2    | 70      | \$31.05              | \$7.80 | \$20.85 | \$0.00                       | \$59.70    |
| 3    | 75      | \$33.26              | \$7.80 | \$20.85 | \$0.00                       | \$61.91    |
| 4    | 80      | \$35.48              | \$7.80 | \$20.85 | \$0.00                       | \$64.13    |
| 5    | 85      | \$37.70              | \$7.80 | \$20.85 | \$0.00                       | \$66.35    |
| 6    | 90      | \$39.92              | \$7.80 | \$20.85 | \$0.00                       | \$68.57    |

**Notes:**

Structural 1:6; Ornamental 1:4

**Apprentice to Journeyworker Ratio:**

|                                      |            |         |        |         |        |         |
|--------------------------------------|------------|---------|--------|---------|--------|---------|
| JACKHAMMER & PAVING BREAKER OPERATOR | 12/01/2017 | \$33.08 | \$7.70 | \$13.60 | \$0.00 | \$54.38 |
| LABORERS - ZONE 2                    | 06/01/2018 | \$33.92 | \$7.70 | \$13.60 | \$0.00 | \$55.22 |
|                                      | 12/01/2018 | \$34.76 | \$7.70 | \$13.60 | \$0.00 | \$56.06 |
|                                      | 06/01/2019 | \$35.63 | \$7.70 | \$13.60 | \$0.00 | \$56.93 |
|                                      | 12/01/2019 | \$36.49 | \$7.70 | \$13.60 | \$0.00 | \$57.79 |
|                                      | 06/01/2020 | \$37.38 | \$7.70 | \$13.60 | \$0.00 | \$58.68 |
|                                      | 12/01/2020 | \$38.27 | \$7.70 | \$13.60 | \$0.00 | \$59.57 |
|                                      | 06/01/2021 | \$39.19 | \$7.70 | \$13.60 | \$0.00 | \$60.49 |
|                                      | 12/01/2021 | \$40.10 | \$7.70 | \$13.60 | \$0.00 | \$61.40 |

For apprentice rates see "Apprentice- LABORER"

|                   |            |         |        |         |        |         |
|-------------------|------------|---------|--------|---------|--------|---------|
| LABORER           | 12/01/2017 | \$32.83 | \$7.70 | \$13.60 | \$0.00 | \$54.13 |
| LABORERS - ZONE 2 | 06/01/2018 | \$33.67 | \$7.70 | \$13.60 | \$0.00 | \$54.97 |
|                   | 12/01/2018 | \$34.51 | \$7.70 | \$13.60 | \$0.00 | \$55.81 |
|                   | 06/01/2019 | \$35.38 | \$7.70 | \$13.60 | \$0.00 | \$56.68 |
|                   | 12/01/2019 | \$36.24 | \$7.70 | \$13.60 | \$0.00 | \$57.54 |
|                   | 06/01/2020 | \$37.13 | \$7.70 | \$13.60 | \$0.00 | \$58.43 |
|                   | 12/01/2020 | \$38.02 | \$7.70 | \$13.60 | \$0.00 | \$59.32 |
|                   | 06/01/2021 | \$38.94 | \$7.70 | \$13.60 | \$0.00 | \$60.24 |
|                   | 12/01/2021 | \$39.85 | \$7.70 | \$13.60 | \$0.00 | \$61.15 |



| Classification | Effective Date | Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|----------------|----------------|-----------|--------|---------|------------------------------|------------|
|----------------|----------------|-----------|--------|---------|------------------------------|------------|

**Apprentice - LABORER - Zone 2**

**Effective Date - 12/01/2017**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 60      | \$19.70              | \$7.70 | \$13.60 | \$0.00                       | \$41.00    |
| 2    | 70      | \$22.98              | \$7.70 | \$13.60 | \$0.00                       | \$44.28    |
| 3    | 80      | \$26.26              | \$7.70 | \$13.60 | \$0.00                       | \$47.56    |
| 4    | 90      | \$29.55              | \$7.70 | \$13.60 | \$0.00                       | \$50.85    |

**Effective Date - 06/01/2018**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 60      | \$20.20              | \$7.70 | \$13.60 | \$0.00                       | \$41.50    |
| 2    | 70      | \$23.57              | \$7.70 | \$13.60 | \$0.00                       | \$44.87    |
| 3    | 80      | \$26.94              | \$7.70 | \$13.60 | \$0.00                       | \$48.24    |
| 4    | 90      | \$30.30              | \$7.70 | \$13.60 | \$0.00                       | \$51.60    |

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

|                           |            |         |        |         |        |         |
|---------------------------|------------|---------|--------|---------|--------|---------|
| LABORER: CARPENTER TENDER | 12/01/2017 | \$32.83 | \$7.70 | \$13.60 | \$0.00 | \$54.13 |
| LABORERS - ZONE 2         | 06/01/2018 | \$33.67 | \$7.70 | \$13.60 | \$0.00 | \$54.97 |
|                           | 12/01/2018 | \$34.51 | \$7.70 | \$13.60 | \$0.00 | \$55.81 |
|                           | 06/01/2019 | \$35.38 | \$7.70 | \$13.60 | \$0.00 | \$56.68 |
|                           | 12/01/2019 | \$36.24 | \$7.70 | \$13.60 | \$0.00 | \$57.54 |
|                           | 06/01/2020 | \$37.13 | \$7.70 | \$13.60 | \$0.00 | \$58.43 |
|                           | 12/01/2020 | \$38.02 | \$7.70 | \$13.60 | \$0.00 | \$59.32 |
|                           | 06/01/2021 | \$38.94 | \$7.70 | \$13.60 | \$0.00 | \$60.24 |
|                           | 12/01/2021 | \$39.85 | \$7.70 | \$13.60 | \$0.00 | \$61.15 |

For apprentice rates see "Apprentice- LABORER"

|                                 |            |         |        |         |        |         |
|---------------------------------|------------|---------|--------|---------|--------|---------|
| LABORER: CEMENT FINISHER TENDER | 12/01/2017 | \$32.83 | \$7.70 | \$13.60 | \$0.00 | \$54.13 |
| LABORERS - ZONE 2               | 06/01/2018 | \$33.67 | \$7.70 | \$13.60 | \$0.00 | \$54.97 |
|                                 | 12/01/2018 | \$34.51 | \$7.70 | \$13.60 | \$0.00 | \$55.81 |
|                                 | 06/01/2019 | \$35.38 | \$7.70 | \$13.60 | \$0.00 | \$56.68 |
|                                 | 12/01/2019 | \$36.24 | \$7.70 | \$13.60 | \$0.00 | \$57.54 |
|                                 | 06/01/2020 | \$37.13 | \$7.70 | \$13.60 | \$0.00 | \$58.43 |
|                                 | 12/01/2020 | \$38.02 | \$7.70 | \$13.60 | \$0.00 | \$59.32 |
|                                 | 06/01/2021 | \$38.94 | \$7.70 | \$13.60 | \$0.00 | \$60.24 |
|                                 | 12/01/2021 | \$39.85 | \$7.70 | \$13.60 | \$0.00 | \$61.15 |

For apprentice rates see "Apprentice- LABORER"

|   |            |         |        |         |        |         |
|---|------------|---------|--------|---------|--------|---------|
| LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER | 12/01/2017 | \$33.03 | \$7.70 | \$13.55 | \$0.00 | \$54.28 |
| LABORERS - ZONE 2                         | 06/01/2018 | \$33.87 | \$7.70 | \$13.55 | \$0.00 | \$55.12 |
|   | 12/01/2018 | \$34.71 | \$7.70 | \$13.55 | \$0.00 | \$55.96 |
|   | 06/01/2019 | \$35.58 | \$7.70 | \$13.55 | \$0.00 | \$56.83 |
|   | 12/01/2019 | \$36.44 | \$7.70 | \$13.55 | \$0.00 | \$57.69 |

For apprentice rates see "Apprentice- LABORER"

| Classification  | Effective Date | Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|---|----------------|-----------|--------|---------|------------------------------|------------|
| LABORER: MASON TENDER<br><i>LABORERS - ZONE 2</i>   | 12/01/2017     | \$33.08   | \$7.70 | \$13.60 | \$0.00                       | \$54.38    |
|   | 06/01/2018     | \$33.92   | \$7.70 | \$13.60 | \$0.00                       | \$55.22    |
|   | 12/01/2018     | \$34.76   | \$7.70 | \$13.60 | \$0.00                       | \$56.06    |
|   | 06/01/2019     | \$35.63   | \$7.70 | \$13.60 | \$0.00                       | \$56.93    |
|   | 12/01/2019     | \$36.49   | \$7.70 | \$13.60 | \$0.00                       | \$57.79    |
|   | 06/01/2020     | \$37.38   | \$7.70 | \$13.60 | \$0.00                       | \$58.68    |
|   | 12/01/2020     | \$38.27   | \$7.70 | \$13.60 | \$0.00                       | \$59.57    |
|   | 06/01/2021     | \$39.19   | \$7.70 | \$13.60 | \$0.00                       | \$60.49    |
|   | 12/01/2021     | \$40.10   | \$7.70 | \$13.60 | \$0.00                       | \$61.40    |
| For apprentice rates see "Apprentice- LABORER"  |                |           |        |         |                              |            |
| LABORER: MULTI-TRADE TENDER<br><i>LABORERS - ZONE 2</i>   | 12/01/2017     | \$32.83   | \$7.70 | \$13.60 | \$0.00                       | \$54.13    |
|   | 06/01/2018     | \$33.67   | \$7.70 | \$13.60 | \$0.00                       | \$54.97    |
|   | 12/01/2018     | \$34.51   | \$7.70 | \$13.60 | \$0.00                       | \$55.81    |
|   | 06/01/2019     | \$35.38   | \$7.70 | \$13.60 | \$0.00                       | \$56.68    |
|   | 12/01/2019     | \$36.24   | \$7.70 | \$13.60 | \$0.00                       | \$57.54    |
|   | 06/01/2020     | \$37.13   | \$7.70 | \$13.60 | \$0.00                       | \$58.43    |
|   | 12/01/2020     | \$38.02   | \$7.70 | \$13.60 | \$0.00                       | \$59.32    |
|   | 06/01/2021     | \$38.94   | \$7.70 | \$13.60 | \$0.00                       | \$60.24    |
|   | 12/01/2021     | \$39.85   | \$7.70 | \$13.60 | \$0.00                       | \$61.15    |
| For apprentice rates see "Apprentice- LABORER"  |                |           |        |         |                              |            |
| LABORER: TREE REMOVER<br><i>LABORERS - ZONE 2</i>   | 12/01/2017     | \$32.83   | \$7.70 | \$13.60 | \$0.00                       | \$54.13    |
|   | 06/01/2018     | \$33.67   | \$7.70 | \$13.60 | \$0.00                       | \$54.97    |
|   | 12/01/2018     | \$34.51   | \$7.70 | \$13.60 | \$0.00                       | \$55.81    |
|   | 06/01/2019     | \$35.38   | \$7.70 | \$13.60 | \$0.00                       | \$56.68    |
|   | 12/01/2019     | \$36.24   | \$7.70 | \$13.60 | \$0.00                       | \$57.54    |
|   | 06/01/2020     | \$37.13   | \$7.70 | \$13.60 | \$0.00                       | \$58.43    |
|   | 12/01/2020     | \$38.02   | \$7.70 | \$13.60 | \$0.00                       | \$59.32    |
|   | 06/01/2021     | \$38.94   | \$7.70 | \$13.60 | \$0.00                       | \$60.24    |
|   | 12/01/2021     | \$39.85   | \$7.70 | \$13.60 | \$0.00                       | \$61.15    |
| This classification applies to all tree work associated with the removal of standing trees, and trimming and removal of branches and limbs when the work is not done for a utility company for the purpose of operation, maintenance or repair of utility company equipment. For apprentice rates see "Apprentice- LABORER" |                |           |        |         |                              |            |
| LASER BEAM OPERATOR<br><i>LABORERS - ZONE 2</i>   | 12/01/2017     | \$33.08   | \$7.70 | \$13.60 | \$0.00                       | \$54.38    |
|   | 06/01/2018     | \$33.92   | \$7.70 | \$13.60 | \$0.00                       | \$55.22    |
|   | 12/01/2018     | \$34.76   | \$7.70 | \$13.60 | \$0.00                       | \$56.06    |
|   | 06/01/2019     | \$35.63   | \$7.70 | \$13.60 | \$0.00                       | \$56.93    |
|   | 12/01/2019     | \$36.49   | \$7.70 | \$13.60 | \$0.00                       | \$57.79    |
|   | 06/01/2020     | \$37.38   | \$7.70 | \$13.60 | \$0.00                       | \$58.68    |
|   | 12/01/2020     | \$38.27   | \$7.70 | \$13.60 | \$0.00                       | \$59.57    |
|   | 06/01/2021     | \$39.19   | \$7.70 | \$13.60 | \$0.00                       | \$60.49    |
|   | 12/01/2021     | \$40.10   | \$7.70 | \$13.60 | \$0.00                       | \$61.40    |
| For apprentice rates see "Apprentice- LABORER"  |                |           |        |         |                              |            |

| Classification  | Effective Date | Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|---|----------------|-----------|---------|---------|------------------------------|------------|
| MARBLE & TILE FINISHERS<br><i>BRICKLAYERS LOCAL 3 - MARBLE &amp; TILE</i> | 02/01/2018     | \$39.82   | \$10.75 | \$18.34 | \$0.00                       | \$68.91    |
|   | 08/01/2018     | \$40.90   | \$10.75 | \$18.47 | \$0.00                       | \$70.12    |
|   | 02/01/2019     | \$41.41   | \$10.75 | \$18.47 | \$0.00                       | \$70.63    |
|   | 08/01/2019     | \$42.49   | \$10.75 | \$18.61 | \$0.00                       | \$71.85    |
|   | 02/01/2020     | \$43.00   | \$10.75 | \$18.61 | \$0.00                       | \$72.36    |
|   | 08/01/2020     | \$44.08   | \$10.75 | \$18.76 | \$0.00                       | \$73.59    |
|   | 02/01/2021     | \$44.59   | \$10.75 | \$18.76 | \$0.00                       | \$74.10    |
|   | 08/01/2021     | \$45.71   | \$10.75 | \$18.92 | \$0.00                       | \$75.38    |
|   | 02/01/2022     | \$46.18   | \$10.75 | \$18.92 | \$0.00                       | \$75.85    |

**Apprentice - MARBLE & TILE FINISHER - Local 3 Marble & Tile**

**Effective Date -** 02/01/2018

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|------------------------------|------------|
| 1    | 50      | \$19.91              | \$10.75 | \$18.34 | \$0.00                       | \$49.00    |
| 2    | 60      | \$23.89              | \$10.75 | \$18.34 | \$0.00                       | \$52.98    |
| 3    | 70      | \$27.87              | \$10.75 | \$18.34 | \$0.00                       | \$56.96    |
| 4    | 80      | \$31.86              | \$10.75 | \$18.34 | \$0.00                       | \$60.95    |
| 5    | 90      | \$35.84              | \$10.75 | \$18.34 | \$0.00                       | \$64.93    |

**Effective Date -** 08/01/2018

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|------------------------------|------------|
| 1    | 50      | \$20.45              | \$10.75 | \$18.47 | \$0.00                       | \$49.67    |
| 2    | 60      | \$24.54              | \$10.75 | \$18.47 | \$0.00                       | \$53.76    |
| 3    | 70      | \$28.63              | \$10.75 | \$18.47 | \$0.00                       | \$57.85    |
| 4    | 80      | \$32.72              | \$10.75 | \$18.47 | \$0.00                       | \$61.94    |
| 5    | 90      | \$36.81              | \$10.75 | \$18.47 | \$0.00                       | \$66.03    |

**Notes:**

**Apprentice to Journeyworker Ratio:1:3**

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| MARBLE MASONS, TILELAYERS & TERRAZZO MECH<br><i>BRICKLAYERS LOCAL 3 - MARBLE &amp; TILE</i> | 02/01/2018 | \$52.10 | \$10.75 | \$20.03 | \$0.00 | \$82.88 |
|   | 08/01/2018 | \$53.45 | \$10.75 | \$20.16 | \$0.00 | \$84.36 |
|   | 02/01/2019 | \$54.07 | \$10.75 | \$20.16 | \$0.00 | \$84.98 |
|   | 08/01/2019 | \$55.42 | \$10.75 | \$20.30 | \$0.00 | \$86.47 |
|   | 02/01/2020 | \$56.05 | \$10.75 | \$20.30 | \$0.00 | \$87.10 |
|   | 08/01/2020 | \$57.40 | \$10.75 | \$20.45 | \$0.00 | \$88.60 |
|   | 02/01/2021 | \$58.04 | \$10.75 | \$20.45 | \$0.00 | \$89.24 |
|   | 08/01/2021 | \$59.44 | \$10.75 | \$20.61 | \$0.00 | \$90.80 |
|   | 02/01/2022 | \$60.01 | \$10.75 | \$20.61 | \$0.00 | \$91.37 |

**Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile****Effective Date -** 02/01/2018

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|------------------------------|------------|
| 1    | 50      | \$26.05              | \$10.75 | \$20.03 | \$0.00                       | \$56.83    |
| 2    | 60      | \$31.26              | \$10.75 | \$20.03 | \$0.00                       | \$62.04    |
| 3    | 70      | \$36.47              | \$10.75 | \$20.03 | \$0.00                       | \$67.25    |
| 4    | 80      | \$41.68              | \$10.75 | \$20.03 | \$0.00                       | \$72.46    |
| 5    | 90      | \$46.89              | \$10.75 | \$20.03 | \$0.00                       | \$77.67    |

**Effective Date -** 08/01/2018

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|------------------------------|------------|
| 1    | 50      | \$26.73              | \$10.75 | \$20.16 | \$0.00                       | \$57.64    |
| 2    | 60      | \$32.07              | \$10.75 | \$20.16 | \$0.00                       | \$62.98    |
| 3    | 70      | \$37.42              | \$10.75 | \$20.16 | \$0.00                       | \$68.33    |
| 4    | 80      | \$42.76              | \$10.75 | \$20.16 | \$0.00                       | \$73.67    |
| 5    | 90      | \$48.11              | \$10.75 | \$20.16 | \$0.00                       | \$79.02    |

**Notes:****Apprentice to Journeyworker Ratio:1:5**

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| MECH. SWEEPER OPERATOR (ON CONST. SITES)<br>OPERATING ENGINEERS LOCAL 4 | 12/01/2017 | \$46.17 | \$10.50 | \$15.50 | \$0.00 | \$72.17 |
|---|------------|---------|---------|---------|--------|---------|

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

|  |            |         |         |         |        |         |
|--|------------|---------|---------|---------|--------|---------|
| MECHANICS MAINTENANCE<br>OPERATING ENGINEERS LOCAL 4 | 12/01/2017 | \$46.17 | \$10.50 | \$15.50 | \$0.00 | \$72.17 |
|--|------------|---------|---------|---------|--------|---------|

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

|  |            |         |        |         |        |         |
|--|------------|---------|--------|---------|--------|---------|
| MILLWRIGHT (Zone 3)<br>MILLWRIGHTS LOCAL 1121 - Zone 3 | 04/01/2018 | \$35.46 | \$9.90 | \$18.50 | \$0.00 | \$63.86 |
|  | 10/01/2018 | \$36.29 | \$9.90 | \$18.50 | \$0.00 | \$64.69 |
|  | 04/01/2019 | \$37.11 | \$9.90 | \$18.50 | \$0.00 | \$65.51 |

**Apprentice - MILLWRIGHT - Local 1121 Zone 3****Effective Date -** 04/01/2018

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 55      | \$19.50              | \$9.90 | \$5.31  | \$0.00                       | \$34.71    |
| 2    | 65      | \$23.05              | \$9.90 | \$15.13 | \$0.00                       | \$48.08    |
| 3    | 75      | \$26.60              | \$9.90 | \$16.10 | \$0.00                       | \$52.60    |
| 4    | 85      | \$30.14              | \$9.90 | \$17.06 | \$0.00                       | \$57.10    |

**Notes:**

Steps are 2,000 hours

**Apprentice to Journeyworker Ratio:1:5**

| Classification  | Effective Date | Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|---|----------------|-----------|---------|---------|------------------------------|------------|
| MORTAR MIXER<br><i>LABORERS - ZONE 2</i>  | 12/01/2017     | \$33.08   | \$7.70  | \$13.60 | \$0.00                       | \$54.38    |
|   | 06/01/2018     | \$33.92   | \$7.70  | \$13.60 | \$0.00                       | \$55.22    |
|   | 12/01/2018     | \$34.76   | \$7.70  | \$13.60 | \$0.00                       | \$56.06    |
|   | 06/01/2019     | \$35.63   | \$7.70  | \$13.60 | \$0.00                       | \$56.93    |
|   | 12/01/2019     | \$36.49   | \$7.70  | \$13.60 | \$0.00                       | \$57.79    |
|   | 06/01/2020     | \$37.38   | \$7.70  | \$13.60 | \$0.00                       | \$58.68    |
|   | 12/01/2020     | \$38.27   | \$7.70  | \$13.60 | \$0.00                       | \$59.57    |
|   | 06/01/2021     | \$39.19   | \$7.70  | \$13.60 | \$0.00                       | \$60.49    |
|   | 12/01/2021     | \$40.10   | \$7.70  | \$13.60 | \$0.00                       | \$61.40    |
| For apprentice rates see "Apprentice- LABORER"                                  |                |           |         |         |                              |            |
| OILER (OTHER THAN TRUCK CRANES, GRADALLS)<br><i>OPERATING ENGINEERS LOCAL 4</i> | 12/01/2017     | \$23.24   | \$10.50 | \$15.50 | \$0.00                       | \$49.24    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                      |                |           |         |         |                              |            |
| OILER (TRUCK CRANES, GRADALLS)<br><i>OPERATING ENGINEERS LOCAL 4</i>            | 12/01/2017     | \$27.40   | \$10.50 | \$15.50 | \$0.00                       | \$53.40    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                      |                |           |         |         |                              |            |
| OTHER POWER DRIVEN EQUIPMENT - CLASS II<br><i>OPERATING ENGINEERS LOCAL 4</i>   | 12/01/2017     | \$46.17   | \$10.50 | \$15.50 | \$0.00                       | \$72.17    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                      |                |           |         |         |                              |            |
| PAINTER (BRIDGES/TANKS)<br><i>PAINTERS LOCAL 35 - ZONE 2</i>                    | 01/01/2017     | \$51.41   | \$7.85  | \$16.10 | \$0.00                       | \$75.36    |

**Apprentice - PAINTER Local 35 - BRIDGES/TANKS**

**Effective Date -** 01/01/2017

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 50      | \$25.71              | \$7.85 | \$0.00  | \$0.00                       | \$33.56    |
| 2    | 55      | \$28.28              | \$7.85 | \$3.66  | \$0.00                       | \$39.79    |
| 3    | 60      | \$30.85              | \$7.85 | \$3.99  | \$0.00                       | \$42.69    |
| 4    | 65      | \$33.42              | \$7.85 | \$4.32  | \$0.00                       | \$45.59    |
| 5    | 70      | \$35.99              | \$7.85 | \$14.11 | \$0.00                       | \$57.95    |
| 6    | 75      | \$38.56              | \$7.85 | \$14.44 | \$0.00                       | \$60.85    |
| 7    | 80      | \$41.13              | \$7.85 | \$14.77 | \$0.00                       | \$63.75    |
| 8    | 90      | \$46.27              | \$7.85 | \$15.44 | \$0.00                       | \$69.56    |

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

|                                     |            |         |        |         |        |         |
|-------------------------------------|------------|---------|--------|---------|--------|---------|
| PAINTER (SPRAY OR SANDBLAST, NEW) * | 01/01/2017 | \$42.31 | \$7.85 | \$16.10 | \$0.00 | \$66.26 |
|-------------------------------------|------------|---------|--------|---------|--------|---------|

\* If 30% or more of surfaces to be painted are new construction,  
NEW paint rate shall be used. *PAINTERS LOCAL 35 - ZONE 2*

## Classification

Effective Date

Base Wage

Health

Pension

Supplemental  
Unemployment

Total Rate

**Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - New****Effective Date -** 01/01/2017

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 50      | \$21.16              | \$7.85 | \$0.00  | \$0.00                       | \$29.01    |
| 2    | 55      | \$23.27              | \$7.85 | \$3.66  | \$0.00                       | \$34.78    |
| 3    | 60      | \$25.39              | \$7.85 | \$3.99  | \$0.00                       | \$37.23    |
| 4    | 65      | \$27.50              | \$7.85 | \$4.32  | \$0.00                       | \$39.67    |
| 5    | 70      | \$29.62              | \$7.85 | \$14.11 | \$0.00                       | \$51.58    |
| 6    | 75      | \$31.73              | \$7.85 | \$14.44 | \$0.00                       | \$54.02    |
| 7    | 80      | \$33.85              | \$7.85 | \$14.77 | \$0.00                       | \$56.47    |
| 8    | 90      | \$38.08              | \$7.85 | \$15.44 | \$0.00                       | \$61.37    |

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PAINTER (SPRAY OR SANDBLAST, REPAINT)

01/01/2017

\$40.37

\$7.85

\$16.10

\$0.00

\$64.32

PAINTERS LOCAL 35 - ZONE 2

**Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint****Effective Date -** 01/01/2017

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 50      | \$20.19              | \$7.85 | \$0.00  | \$0.00                       | \$28.04    |
| 2    | 55      | \$22.20              | \$7.85 | \$3.66  | \$0.00                       | \$33.71    |
| 3    | 60      | \$24.22              | \$7.85 | \$3.99  | \$0.00                       | \$36.06    |
| 4    | 65      | \$26.24              | \$7.85 | \$4.32  | \$0.00                       | \$38.41    |
| 5    | 70      | \$28.26              | \$7.85 | \$14.11 | \$0.00                       | \$50.22    |
| 6    | 75      | \$30.28              | \$7.85 | \$14.44 | \$0.00                       | \$52.57    |
| 7    | 80      | \$32.30              | \$7.85 | \$14.77 | \$0.00                       | \$54.92    |
| 8    | 90      | \$36.33              | \$7.85 | \$15.44 | \$0.00                       | \$59.62    |

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PAINTER (TRAFFIC MARKINGS)

12/01/2017

\$32.83

\$7.70

\$13.60

\$0.00

\$54.13

LABORERS - ZONE 2

06/01/2018

\$33.67

\$7.70

\$13.60

\$0.00

\$54.97

12/01/2018

\$34.51

\$7.70

\$13.60

\$0.00

\$55.81

06/01/2019

\$35.38

\$7.70

\$13.60

\$0.00

\$56.68

12/01/2019

\$36.24

\$7.70

\$13.60

\$0.00

\$57.54

06/01/2020

\$37.13

\$7.70

\$13.60

\$0.00

\$58.43

12/01/2020

\$38.02

\$7.70

\$13.60

\$0.00

\$59.32

06/01/2021

\$38.94

\$7.70

\$13.60

\$0.00

\$60.24

12/01/2021

\$39.85

\$7.70

\$13.60

\$0.00

\$61.15

For Apprentice rates see "Apprentice- LABORER"

| Classification   | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|--------|---------|---------------------------|------------|
| PAINTER / TAPER (BRUSH, NEW) *   | 01/01/2017     | \$40.91   | \$7.85 | \$16.10 | \$0.00                    | \$64.86    |
| * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. <i>PAINTERS LOCAL 35 - ZONE 2</i> |                |           |        |         |                           |            |

**Apprentice - PAINTER - Local 35 Zone 2 - BRUSH NEW**

**Effective Date -** 01/01/2017

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$20.46              | \$7.85 | \$0.00  | \$0.00                    | \$28.31    |
| 2    | 55      | \$22.50              | \$7.85 | \$3.66  | \$0.00                    | \$34.01    |
| 3    | 60      | \$24.55              | \$7.85 | \$3.99  | \$0.00                    | \$36.39    |
| 4    | 65      | \$26.59              | \$7.85 | \$4.32  | \$0.00                    | \$38.76    |
| 5    | 70      | \$28.64              | \$7.85 | \$14.11 | \$0.00                    | \$50.60    |
| 6    | 75      | \$30.68              | \$7.85 | \$14.44 | \$0.00                    | \$52.97    |
| 7    | 80      | \$32.73              | \$7.85 | \$14.77 | \$0.00                    | \$55.35    |
| 8    | 90      | \$36.82              | \$7.85 | \$15.44 | \$0.00                    | \$60.11    |

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

|                                   |            |         |        |         |        |         |
|-----------------------------------|------------|---------|--------|---------|--------|---------|
| PAINTER / TAPER (BRUSH, REPAINT)  | 01/01/2017 | \$38.97 | \$7.85 | \$16.10 | \$0.00 | \$62.92 |
| <i>PAINTERS LOCAL 35 - ZONE 2</i> |            |         |        |         |        |         |

**Apprentice - PAINTER Local 35 Zone 2 - BRUSH REPAINT**

**Effective Date -** 01/01/2017

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$19.49              | \$7.85 | \$0.00  | \$0.00                    | \$27.34    |
| 2    | 55      | \$21.43              | \$7.85 | \$3.66  | \$0.00                    | \$32.94    |
| 3    | 60      | \$23.38              | \$7.85 | \$3.99  | \$0.00                    | \$35.22    |
| 4    | 65      | \$25.33              | \$7.85 | \$4.32  | \$0.00                    | \$37.50    |
| 5    | 70      | \$27.28              | \$7.85 | \$14.11 | \$0.00                    | \$49.24    |
| 6    | 75      | \$29.23              | \$7.85 | \$14.44 | \$0.00                    | \$51.52    |
| 7    | 80      | \$31.18              | \$7.85 | \$14.77 | \$0.00                    | \$53.80    |
| 8    | 90      | \$35.07              | \$7.85 | \$15.44 | \$0.00                    | \$58.36    |

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

|   |            |         |        |         |        |         |
|---|------------|---------|--------|---------|--------|---------|
| PANEL & PICKUP TRUCKS DRIVER                      | 12/01/2012 | \$30.28 | \$9.07 | \$8.00  | \$0.00 | \$47.35 |
| <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>      |            |         |        |         |        |         |
| PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) | 08/01/2017 | \$41.52 | \$9.90 | \$21.15 | \$0.00 | \$72.57 |
| <i>PILE DRIVER LOCAL 56 (ZONE 2)</i>              | 08/01/2018 | \$42.93 | \$9.90 | \$21.15 | \$0.00 | \$73.98 |
|   | 08/01/2019 | \$44.61 | \$9.90 | \$21.15 | \$0.00 | \$75.66 |

For apprentice rates see "Apprentice- PILE DRIVER"

| Classification                | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|-------------------------------|----------------|-----------|--------|---------|---------------------------|------------|
| PILE DRIVER                   | 08/01/2017     | \$41.52   | \$9.90 | \$21.15 | \$0.00                    | \$72.57    |
| PILE DRIVER LOCAL 56 (ZONE 2) | 08/01/2018     | \$42.93   | \$9.90 | \$21.15 | \$0.00                    | \$73.98    |
|                               | 08/01/2019     | \$44.61   | \$9.90 | \$21.15 | \$0.00                    | \$75.66    |

**Apprentice - PILE DRIVER - Local 56 Zone 2**

**Effective Date - 08/01/2017**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 0       | \$0.00               | \$0.00 | \$0.00  | \$0.00                    | \$0.00     |

**Notes:** Apprentice wages shall be no less than the following Steps;  
(Same as set in Zone 1)  
1\$53.19/2\$57.61/3\$62.04/4\$64.25/5\$66.47/6\$66.47/7\$70.89/8\$70.89

**Apprentice to Journeyworker Ratio:1:5**

|                   |            |         |        |         |        |         |
|-------------------|------------|---------|--------|---------|--------|---------|
| PIPELAYER         | 12/01/2017 | \$33.08 | \$7.70 | \$13.60 | \$0.00 | \$54.38 |
| LABORERS - ZONE 2 | 06/01/2018 | \$33.92 | \$7.70 | \$13.60 | \$0.00 | \$55.22 |
|                   | 12/01/2018 | \$34.76 | \$7.70 | \$13.60 | \$0.00 | \$56.06 |
|                   | 06/01/2019 | \$35.63 | \$7.70 | \$13.60 | \$0.00 | \$56.93 |
|                   | 12/01/2019 | \$36.49 | \$7.70 | \$13.60 | \$0.00 | \$57.79 |
|                   | 06/01/2020 | \$37.38 | \$7.70 | \$13.60 | \$0.00 | \$58.68 |
|                   | 12/01/2020 | \$38.27 | \$7.70 | \$13.60 | \$0.00 | \$59.57 |
|                   | 06/01/2021 | \$39.19 | \$7.70 | \$13.60 | \$0.00 | \$60.49 |
|                   | 12/01/2021 | \$40.10 | \$7.70 | \$13.60 | \$0.00 | \$61.40 |

For apprentice rates see "Apprentice- LABORER"

|                      |            |         |        |         |        |         |
|----------------------|------------|---------|--------|---------|--------|---------|
| PLUMBER & PIPEFITTER | 03/01/2018 | \$43.96 | \$9.35 | \$14.91 | \$0.00 | \$68.22 |
| PLUMBERS LOCAL 4     |            |         |        |         |        |         |

**Apprentice - PLUMBER/PIPEFITTER - Local 4**

**Effective Date - 03/01/2018**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 40      | \$17.58              | \$9.35 | \$0.00  | \$0.00                    | \$26.93    |
| 2    | 50      | \$21.98              | \$9.35 | \$0.00  | \$0.00                    | \$31.33    |
| 3    | 60      | \$26.38              | \$9.35 | \$0.00  | \$0.00                    | \$35.73    |
| 4    | 70      | \$30.77              | \$9.35 | \$5.20  | \$0.00                    | \$45.32    |
| 5    | 80      | \$35.17              | \$9.35 | \$5.20  | \$0.00                    | \$49.72    |

**Notes:**  
Steps - 2000 hrs; Step 4 w/lic 75%, Step 5 w/lic 85%  
Step 4 w/lic \$47.52, Step 5 w/lic \$51.92

**Apprentice to Journeyworker Ratio:1:3**

|                            |            |         |        |         |        |         |
|----------------------------|------------|---------|--------|---------|--------|---------|
| PNEUMATIC CONTROLS (TEMP.) | 03/01/2018 | \$43.96 | \$9.35 | \$14.91 | \$0.00 | \$68.22 |
| PLUMBERS LOCAL 4           |            |         |        |         |        |         |

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"



| Classification   | Effective Date | Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|------------|
| PNEUMATIC DRILL/TOOL OPERATOR<br><i>LABORERS - ZONE 2</i>                    | 12/01/2017     | \$33.08   | \$7.70  | \$13.60 | \$0.00                       | \$54.38    |
|  | 06/01/2018     | \$33.92   | \$7.70  | \$13.60 | \$0.00                       | \$55.22    |
|  | 12/01/2018     | \$34.76   | \$7.70  | \$13.60 | \$0.00                       | \$56.06    |
|  | 06/01/2019     | \$35.63   | \$7.70  | \$13.60 | \$0.00                       | \$56.93    |
|  | 12/01/2019     | \$36.49   | \$7.70  | \$13.60 | \$0.00                       | \$57.79    |
|  | 06/01/2020     | \$37.38   | \$7.70  | \$13.60 | \$0.00                       | \$58.68    |
|  | 12/01/2020     | \$38.27   | \$7.70  | \$13.60 | \$0.00                       | \$59.57    |
|  | 06/01/2021     | \$39.19   | \$7.70  | \$13.60 | \$0.00                       | \$60.49    |
|  | 12/01/2021     | \$40.10   | \$7.70  | \$13.60 | \$0.00                       | \$61.40    |
| For apprentice rates see "Apprentice- LABORER"                               |                |           |         |         |                              |            |
| POWDERMAN & BLASTER<br><i>LABORERS - ZONE 2</i>                              | 12/01/2017     | \$33.83   | \$7.70  | \$13.60 | \$0.00                       | \$55.13    |
|  | 06/01/2018     | \$34.67   | \$7.70  | \$13.60 | \$0.00                       | \$55.97    |
|  | 12/01/2018     | \$35.51   | \$7.70  | \$13.60 | \$0.00                       | \$56.81    |
|  | 06/01/2019     | \$36.38   | \$7.70  | \$13.60 | \$0.00                       | \$57.68    |
|  | 12/01/2019     | \$37.24   | \$7.70  | \$13.60 | \$0.00                       | \$58.54    |
|  | 06/01/2020     | \$38.13   | \$7.70  | \$13.60 | \$0.00                       | \$59.43    |
|  | 12/01/2020     | \$39.02   | \$7.70  | \$13.60 | \$0.00                       | \$60.32    |
|  | 06/01/2021     | \$39.94   | \$7.70  | \$13.60 | \$0.00                       | \$61.24    |
|  | 12/01/2021     | \$40.85   | \$7.70  | \$13.60 | \$0.00                       | \$62.15    |
| For apprentice rates see "Apprentice- LABORER"                               |                |           |         |         |                              |            |
| POWER SHOVEL/DERRICK/TRENCHING MACHINE<br><i>OPERATING ENGINEERS LOCAL 4</i> | 12/01/2017     | \$46.63   | \$10.50 | \$15.50 | \$0.00                       | \$72.63    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                   |                |           |         |         |                              |            |
| PUMP OPERATOR (CONCRETE)<br><i>OPERATING ENGINEERS LOCAL 4</i>               | 12/01/2017     | \$46.63   | \$10.50 | \$15.50 | \$0.00                       | \$72.63    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                   |                |           |         |         |                              |            |
| PUMP OPERATOR (DEWATERING, OTHER)<br><i>OPERATING ENGINEERS LOCAL 4</i>      | 12/01/2017     | \$31.80   | \$10.50 | \$15.50 | \$0.00                       | \$57.80    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                   |                |           |         |         |                              |            |
| READY-MIX CONCRETE DRIVER<br><i>TEAMSTERS LOCAL 170</i>                      | 03/01/2018     | \$25.04   | \$10.24 | \$8.46  | \$0.00                       | \$43.74    |
|  | 05/01/2018     | \$25.09   | \$10.24 | \$8.56  | \$0.00                       | \$43.89    |
|  | 12/01/2018     | \$25.12   | \$10.24 | \$8.56  | \$0.00                       | \$43.92    |
|  | 01/01/2019     | \$25.12   | \$10.41 | \$8.56  | \$0.00                       | \$44.09    |
|  | 12/01/2019     | \$25.15   | \$10.41 | \$8.56  | \$0.00                       | \$44.12    |
|  | 01/01/2020     | \$25.15   | \$10.46 | \$8.56  | \$0.00                       | \$44.17    |
| RECLAIMERS<br><i>OPERATING ENGINEERS LOCAL 4</i>                             | 12/01/2017     | \$46.17   | \$10.50 | \$15.50 | \$0.00                       | \$72.17    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                   |                |           |         |         |                              |            |
| RIDE-ON MOTORIZED BUGGY OPERATOR<br><i>LABORERS - ZONE 2</i>                 | 12/01/2017     | \$33.08   | \$7.70  | \$13.60 | \$0.00                       | \$54.38    |
|  | 06/01/2018     | \$33.92   | \$7.70  | \$13.60 | \$0.00                       | \$55.22    |
|  | 12/01/2018     | \$34.76   | \$7.70  | \$13.60 | \$0.00                       | \$56.06    |
|  | 06/01/2019     | \$35.63   | \$7.70  | \$13.60 | \$0.00                       | \$56.93    |
|  | 12/01/2019     | \$36.49   | \$7.70  | \$13.60 | \$0.00                       | \$57.79    |
|  | 06/01/2020     | \$37.38   | \$7.70  | \$13.60 | \$0.00                       | \$58.68    |
|  | 12/01/2020     | \$38.27   | \$7.70  | \$13.60 | \$0.00                       | \$59.57    |
|  | 06/01/2021     | \$39.19   | \$7.70  | \$13.60 | \$0.00                       | \$60.49    |
|  | 12/01/2021     | \$40.10   | \$7.70  | \$13.60 | \$0.00                       | \$61.40    |
| For apprentice rates see "Apprentice- LABORER"                               |                |           |         |         |                              |            |

| Classification   | Effective Date | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|---------------------------|------------|
| ROLLER/SPREADER/MULCHING MACHINE<br><i>OPERATING ENGINEERS LOCAL 4</i>           | 12/01/2017     | \$46.17   | \$10.50 | \$15.50 | \$0.00                    | \$72.17    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                       |                |           |         |         |                           |            |
| ROOFER (Inc.Roofers Waterproofing &Roofers Damproofg)<br><i>ROOFERS LOCAL 33</i> | 02/01/2018     | \$42.36   | \$11.35 | \$14.80 | \$0.00                    | \$68.51    |
|  | 08/01/2018     | \$43.46   | \$11.35 | \$14.80 | \$0.00                    | \$69.61    |
|  | 02/01/2019     | \$44.61   | \$11.35 | \$14.80 | \$0.00                    | \$70.76    |

**Apprentice - ROOFER - Local 33**

**Effective Date - 02/01/2018**

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$21.18              | \$11.35 | \$3.44  | \$0.00                    | \$35.97    |
| 2    | 60      | \$25.42              | \$11.35 | \$14.80 | \$0.00                    | \$51.57    |
| 3    | 65      | \$27.53              | \$11.35 | \$14.80 | \$0.00                    | \$53.68    |
| 4    | 75      | \$31.77              | \$11.35 | \$14.80 | \$0.00                    | \$57.92    |
| 5    | 85      | \$36.01              | \$11.35 | \$14.80 | \$0.00                    | \$62.16    |

**Effective Date - 08/01/2018**

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$21.73              | \$11.35 | \$3.44  | \$0.00                    | \$36.52    |
| 2    | 60      | \$26.08              | \$11.35 | \$14.80 | \$0.00                    | \$52.23    |
| 3    | 65      | \$28.25              | \$11.35 | \$14.80 | \$0.00                    | \$54.40    |
| 4    | 75      | \$32.60              | \$11.35 | \$14.80 | \$0.00                    | \$58.75    |
| 5    | 85      | \$36.94              | \$11.35 | \$14.80 | \$0.00                    | \$63.09    |

**Notes:** \*\* 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1  
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.  
(Hot Pitch Mechanics' receive \$1.00 hr. above ROOFER)

**Apprentice to Journeyworker Ratio:\*\***

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| ROOFER SLATE / TILE / PRECAST CONCRETE<br><i>ROOFERS LOCAL 33</i> | 02/01/2018 | \$42.61 | \$11.35 | \$14.80 | \$0.00 | \$68.76 |
|   | 08/01/2018 | \$43.71 | \$11.35 | \$14.80 | \$0.00 | \$69.86 |
|   | 02/01/2019 | \$44.86 | \$11.35 | \$14.80 | \$0.00 | \$71.01 |

For apprentice rates see "Apprentice- ROOFER"

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| SHEETMETAL WORKER<br><i>SHEETMETAL WORKERS LOCAL 63</i> | 01/01/2018 | \$32.99 | \$10.64 | \$16.22 | \$1.77 | \$61.62 |
|   | 07/01/2018 | \$33.74 | \$10.64 | \$16.22 | \$1.77 | \$62.37 |
|   | 01/01/2019 | \$34.74 | \$10.64 | \$16.22 | \$1.77 | \$63.37 |
|   | 07/01/2019 | \$35.74 | \$10.64 | \$16.22 | \$1.77 | \$64.37 |
|   | 01/01/2020 | \$36.99 | \$10.64 | \$16.22 | \$1.77 | \$65.62 |

**Apprentice - SHEET METAL WORKER - Local 63****Effective Date - 01/01/2018**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 45      | \$14.85              | \$6.21 | \$4.67  | \$0.00                       | \$25.73    |
| 2    | 50      | \$16.50              | \$6.55 | \$5.19  | \$0.00                       | \$28.24    |
| 3    | 55      | \$18.14              | \$6.88 | \$9.33  | \$1.03                       | \$35.38    |
| 4    | 60      | \$19.79              | \$7.22 | \$9.33  | \$1.09                       | \$37.43    |
| 5    | 65      | \$21.44              | \$7.55 | \$9.33  | \$1.15                       | \$39.47    |
| 6    | 70      | \$23.09              | \$7.88 | \$9.33  | \$1.21                       | \$41.51    |
| 7    | 75      | \$24.74              | \$8.22 | \$9.33  | \$1.27                       | \$43.56    |
| 8    | 80      | \$26.39              | \$9.30 | \$15.18 | \$1.53                       | \$52.40    |
| 9    | 85      | \$28.04              | \$9.64 | \$15.18 | \$1.59                       | \$54.45    |
| 10   | 90      | \$29.69              | \$9.98 | \$15.18 | \$1.65                       | \$56.50    |

**Effective Date - 07/01/2018**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 45      | \$15.18              | \$6.21 | \$4.67  | \$0.00                       | \$26.06    |
| 2    | 50      | \$16.87              | \$6.55 | \$5.19  | \$0.00                       | \$28.61    |
| 3    | 55      | \$18.56              | \$6.88 | \$9.33  | \$1.04                       | \$35.81    |
| 4    | 60      | \$20.24              | \$7.22 | \$9.33  | \$1.10                       | \$37.89    |
| 5    | 65      | \$21.93              | \$7.55 | \$9.33  | \$1.16                       | \$39.97    |
| 6    | 70      | \$23.62              | \$7.88 | \$9.33  | \$1.22                       | \$42.05    |
| 7    | 75      | \$25.31              | \$8.22 | \$9.33  | \$1.29                       | \$44.15    |
| 8    | 80      | \$26.99              | \$9.30 | \$15.18 | \$1.54                       | \$53.01    |
| 9    | 85      | \$28.68              | \$9.64 | \$15.18 | \$1.61                       | \$55.11    |
| 10   | 90      | \$30.37              | \$9.98 | \$15.18 | \$1.67                       | \$57.20    |

**Notes:****Apprentice to Journeyworker Ratio:1:3**

SIGN ERECTOR

PAINTERS LOCAL 35 - ZONE 2

06/01/2013

\$25.81

\$7.07

\$7.05

\$0.00

\$39.93

**Classification**

**Effective Date**

**Base Wage**

**Health**

**Pension**

**Supplemental  
Unemployment**

**Total Rate**

**Apprentice - SIGN ERECTOR - Local 35 Zone 2**

**Effective Date - 06/01/2013**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 50      | \$12.91              | \$7.07 | \$0.00  | \$0.00                       | \$19.98    |
| 2    | 55      | \$14.20              | \$7.07 | \$2.45  | \$0.00                       | \$23.72    |
| 3    | 60      | \$15.49              | \$7.07 | \$2.45  | \$0.00                       | \$25.01    |
| 4    | 65      | \$16.78              | \$7.07 | \$2.45  | \$0.00                       | \$26.30    |
| 5    | 70      | \$18.07              | \$7.07 | \$7.05  | \$0.00                       | \$32.19    |
| 6    | 75      | \$19.36              | \$7.07 | \$7.05  | \$0.00                       | \$33.48    |
| 7    | 80      | \$20.65              | \$7.07 | \$7.05  | \$0.00                       | \$34.77    |
| 8    | 85      | \$21.94              | \$7.07 | \$7.05  | \$0.00                       | \$36.06    |
| 9    | 90      | \$23.23              | \$7.07 | \$7.05  | \$0.00                       | \$37.35    |

**Notes:**

Steps are 4 mos.

**Apprentice to Journeyworker Ratio:1:1**

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| SPECIALIZED EARTH MOVING EQUIP < 35 TONS<br>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B | 12/01/2016 | \$32.44 | \$10.91 | \$10.89 | \$0.00 | \$54.24 |
| SPECIALIZED EARTH MOVING EQUIP > 35 TONS<br>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B | 12/01/2016 | \$32.73 | \$10.91 | \$10.89 | \$0.00 | \$54.53 |
| SPRINKLER FITTER<br>SPRINKLER FITTERS LOCAL 669                                   | 04/01/2018 | \$41.51 | \$9.67  | \$12.88 | \$0.00 | \$64.06 |
|   | 01/01/2019 | \$41.51 | \$10.02 | \$13.08 | \$0.00 | \$64.61 |

**Apprentice - SPRINKLER FITTER - Local 669****Effective Date -** 04/01/2018

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|------------------------------|------------|
| 1    | 45      | \$18.68              | \$7.75 | \$0.00  | \$0.00                       | \$26.43    |
| 2    | 50      | \$20.76              | \$7.75 | \$0.00  | \$0.00                       | \$28.51    |
| 3    | 55      | \$22.83              | \$9.67 | \$7.05  | \$0.00                       | \$39.55    |
| 4    | 60      | \$24.91              | \$9.67 | \$7.05  | \$0.00                       | \$41.63    |
| 5    | 65      | \$26.98              | \$9.67 | \$7.30  | \$0.00                       | \$43.95    |
| 6    | 70      | \$29.06              | \$9.67 | \$7.30  | \$0.00                       | \$46.03    |
| 7    | 75      | \$31.13              | \$9.67 | \$7.30  | \$0.00                       | \$48.10    |
| 8    | 80      | \$33.21              | \$9.67 | \$7.30  | \$0.00                       | \$50.18    |
| 9    | 85      | \$35.28              | \$9.67 | \$7.30  | \$0.00                       | \$52.25    |
| 10   | 90      | \$37.36              | \$9.67 | \$7.30  | \$0.00                       | \$54.33    |

**Effective Date -** 01/01/2019

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|------------------------------|------------|
| 1    | 45      | \$18.68              | \$7.75  | \$0.00  | \$0.00                       | \$26.43    |
| 2    | 50      | \$20.76              | \$7.75  | \$0.00  | \$0.00                       | \$28.51    |
| 3    | 55      | \$22.83              | \$10.02 | \$7.25  | \$0.00                       | \$40.10    |
| 4    | 60      | \$24.91              | \$10.02 | \$7.25  | \$0.00                       | \$42.18    |
| 5    | 65      | \$26.98              | \$10.02 | \$7.50  | \$0.00                       | \$44.50    |
| 6    | 70      | \$29.06              | \$10.02 | \$7.50  | \$0.00                       | \$46.58    |
| 7    | 75      | \$31.13              | \$10.02 | \$7.50  | \$0.00                       | \$48.65    |
| 8    | 80      | \$33.21              | \$10.02 | \$7.50  | \$0.00                       | \$50.73    |
| 9    | 85      | \$35.28              | \$10.02 | \$7.50  | \$0.00                       | \$52.80    |
| 10   | 90      | \$37.36              | \$10.02 | \$7.50  | \$0.00                       | \$54.88    |

**Notes:****Apprentice to Journeyworker Ratio:1:1**

|  |            |         |         |         |        |         |
|--|------------|---------|---------|---------|--------|---------|
| STEAM BOILER OPERATOR<br>OPERATING ENGINEERS LOCAL 4 | 12/01/2017 | \$46.17 | \$10.50 | \$15.50 | \$0.00 | \$72.17 |
|--|------------|---------|---------|---------|--------|---------|

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN<br>OPERATING ENGINEERS LOCAL 4 | 12/01/2017 | \$46.17 | \$10.50 | \$15.50 | \$0.00 | \$72.17 |
|---|------------|---------|---------|---------|--------|---------|

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

| Classification   | Effective Date | Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|------------|
| TERRAZZO FINISHERS<br><i>BRICKLAYERS LOCAL 3 - MARBLE &amp; TILE</i> | 02/01/2018     | \$51.00   | \$10.75 | \$20.03 | \$0.00                       | \$81.78    |
|  | 08/01/2018     | \$52.35   | \$10.75 | \$20.16 | \$0.00                       | \$83.26    |
|  | 02/01/2019     | \$52.99   | \$10.75 | \$20.16 | \$0.00                       | \$83.90    |
|  | 08/01/2019     | \$54.34   | \$10.75 | \$20.30 | \$0.00                       | \$85.39    |
|  | 02/01/2020     | \$54.98   | \$10.75 | \$20.30 | \$0.00                       | \$86.03    |
|  | 08/01/2020     | \$56.33   | \$10.75 | \$20.45 | \$0.00                       | \$87.53    |
|  | 02/01/2021     | \$56.97   | \$10.75 | \$20.45 | \$0.00                       | \$88.17    |
|  | 08/01/2021     | \$58.37   | \$10.75 | \$20.61 | \$0.00                       | \$89.73    |
|  | 02/01/2022     | \$58.96   | \$10.75 | \$20.61 | \$0.00                       | \$90.32    |

**Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile**

**Effective Date -** 02/01/2018

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|------------------------------|------------|
| 1    | 50      | \$25.50              | \$10.75 | \$20.03 | \$0.00                       | \$56.28    |
| 2    | 60      | \$30.60              | \$10.75 | \$20.03 | \$0.00                       | \$61.38    |
| 3    | 70      | \$35.70              | \$10.75 | \$20.03 | \$0.00                       | \$66.48    |
| 4    | 80      | \$40.80              | \$10.75 | \$20.03 | \$0.00                       | \$71.58    |
| 5    | 90      | \$45.90              | \$10.75 | \$20.03 | \$0.00                       | \$76.68    |

**Notes:**

**Apprentice to Journeyworker Ratio:1:3**

|  |            |         |        |         |        |         |
|--|------------|---------|--------|---------|--------|---------|
| TEST BORING DRILLER<br><i>LABORERS - FOUNDATION AND MARINE</i> | 12/01/2017 | \$38.85 | \$7.70 | \$14.95 | \$0.00 | \$61.50 |
|  | 06/01/2018 | \$39.80 | \$7.70 | \$14.95 | \$0.00 | \$62.45 |
|  | 12/01/2018 | \$40.75 | \$7.70 | \$14.95 | \$0.00 | \$63.40 |
|  | 06/01/2019 | \$41.75 | \$7.70 | \$14.95 | \$0.00 | \$64.40 |
|  | 12/01/2019 | \$42.75 | \$7.70 | \$14.95 | \$0.00 | \$65.40 |
|  | 06/01/2020 | \$43.74 | \$7.70 | \$14.95 | \$0.00 | \$66.39 |
|  | 12/01/2020 | \$44.72 | \$7.70 | \$14.95 | \$0.00 | \$67.37 |
|  | 06/01/2021 | \$45.74 | \$7.70 | \$14.95 | \$0.00 | \$68.39 |
|  | 12/01/2021 | \$46.75 | \$7.70 | \$14.95 | \$0.00 | \$69.40 |

For apprentice rates see "Apprentice- LABORER"

|   |            |         |        |         |        |         |
|---|------------|---------|--------|---------|--------|---------|
| TEST BORING DRILLER HELPER<br><i>LABORERS - FOUNDATION AND MARINE</i> | 12/01/2017 | \$37.57 | \$7.70 | \$14.95 | \$0.00 | \$60.22 |
|   | 06/01/2018 | \$38.52 | \$7.70 | \$14.95 | \$0.00 | \$61.17 |
|   | 12/01/2018 | \$39.47 | \$7.70 | \$14.95 | \$0.00 | \$62.12 |
|   | 06/01/2019 | \$40.47 | \$7.70 | \$14.95 | \$0.00 | \$63.12 |
|   | 12/01/2019 | \$41.47 | \$7.70 | \$14.95 | \$0.00 | \$64.12 |
|   | 06/01/2020 | \$42.46 | \$7.70 | \$14.95 | \$0.00 | \$65.11 |
|   | 12/01/2020 | \$43.44 | \$7.70 | \$14.95 | \$0.00 | \$66.09 |
|   | 06/01/2021 | \$44.46 | \$7.70 | \$14.95 | \$0.00 | \$67.11 |
|   | 12/01/2021 | \$45.47 | \$7.70 | \$14.95 | \$0.00 | \$68.12 |

For apprentice rates see "Apprentice- LABORER"

| Classification  | Effective Date | Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|---|----------------|-----------|---------|---------|------------------------------|------------|
| TEST BORING LABORER<br><i>LABORERS - FOUNDATION AND MARINE</i>                      | 12/01/2017     | \$37.45   | \$7.70  | \$14.95 | \$0.00                       | \$60.10    |
|   | 06/01/2018     | \$38.40   | \$7.70  | \$14.95 | \$0.00                       | \$61.05    |
|   | 12/01/2018     | \$39.35   | \$7.70  | \$14.95 | \$0.00                       | \$62.00    |
|   | 06/01/2019     | \$40.35   | \$7.70  | \$14.95 | \$0.00                       | \$63.00    |
|   | 12/01/2019     | \$41.35   | \$7.70  | \$14.95 | \$0.00                       | \$64.00    |
|   | 06/01/2020     | \$42.34   | \$7.70  | \$14.95 | \$0.00                       | \$64.99    |
|   | 12/01/2020     | \$43.32   | \$7.70  | \$14.95 | \$0.00                       | \$65.97    |
|   | 06/01/2021     | \$44.34   | \$7.70  | \$14.95 | \$0.00                       | \$66.99    |
|   | 12/01/2021     | \$45.35   | \$7.70  | \$14.95 | \$0.00                       | \$68.00    |
| For apprentice rates see "Apprentice- LABORER"                                      |                |           |         |         |                              |            |
| TRACTORS/PORTABLE STEAM GENERATORS<br><i>OPERATING ENGINEERS LOCAL 4</i>            | 12/01/2017     | \$46.17   | \$10.50 | \$15.50 | \$0.00                       | \$72.17    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                          |                |           |         |         |                              |            |
| TRAILERS FOR EARTH MOVING EQUIPMENT<br><i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i> | 12/01/2016     | \$33.02   | \$10.91 | \$10.89 | \$0.00                       | \$54.82    |
| TUNNEL WORK - COMPRESSED AIR<br><i>LABORERS (COMPRESSED AIR)</i>                    | 12/01/2017     | \$49.73   | \$7.70  | \$15.35 | \$0.00                       | \$72.78    |
|   | 06/01/2018     | \$50.68   | \$7.70  | \$15.35 | \$0.00                       | \$73.73    |
|   | 12/01/2018     | \$51.63   | \$7.70  | \$15.35 | \$0.00                       | \$74.68    |
|   | 06/01/2019     | \$52.63   | \$7.70  | \$15.35 | \$0.00                       | \$75.68    |
|   | 12/01/2019     | \$53.63   | \$7.70  | \$15.35 | \$0.00                       | \$76.68    |
|   | 06/01/2020     | \$54.62   | \$7.70  | \$15.35 | \$0.00                       | \$77.67    |
|   | 12/01/2020     | \$55.60   | \$7.70  | \$15.35 | \$0.00                       | \$78.65    |
|   | 06/01/2021     | \$56.62   | \$7.70  | \$15.35 | \$0.00                       | \$79.67    |
|   | 12/01/2021     | \$57.63   | \$7.70  | \$15.35 | \$0.00                       | \$80.68    |
| For apprentice rates see "Apprentice- LABORER"                                      |                |           |         |         |                              |            |
| TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)<br><i>LABORERS (COMPRESSED AIR)</i>       | 12/01/2017     | \$51.73   | \$7.70  | \$15.35 | \$0.00                       | \$74.78    |
|   | 06/01/2018     | \$52.68   | \$7.70  | \$15.35 | \$0.00                       | \$75.73    |
|   | 12/01/2018     | \$53.63   | \$7.70  | \$15.35 | \$0.00                       | \$76.68    |
|   | 06/01/2019     | \$54.63   | \$7.70  | \$15.35 | \$0.00                       | \$77.68    |
|   | 12/01/2019     | \$55.63   | \$7.70  | \$15.35 | \$0.00                       | \$78.68    |
|   | 06/01/2020     | \$56.62   | \$7.70  | \$15.35 | \$0.00                       | \$79.67    |
|   | 12/01/2020     | \$57.60   | \$7.70  | \$15.35 | \$0.00                       | \$80.65    |
|   | 06/01/2021     | \$58.62   | \$7.70  | \$15.35 | \$0.00                       | \$81.67    |
|   | 12/01/2021     | \$59.63   | \$7.70  | \$15.35 | \$0.00                       | \$82.68    |
| For apprentice rates see "Apprentice- LABORER"                                      |                |           |         |         |                              |            |
| TUNNEL WORK - FREE AIR<br><i>LABORERS (FREE AIR TUNNEL)</i>                         | 12/01/2017     | \$41.80   | \$7.70  | \$15.35 | \$0.00                       | \$64.85    |
|   | 06/01/2018     | \$42.75   | \$7.70  | \$15.35 | \$0.00                       | \$65.80    |
|   | 12/01/2018     | \$43.70   | \$7.70  | \$15.35 | \$0.00                       | \$66.75    |
|   | 06/01/2019     | \$44.70   | \$7.70  | \$15.35 | \$0.00                       | \$67.75    |
|   | 12/01/2019     | \$45.70   | \$7.70  | \$15.35 | \$0.00                       | \$68.75    |
|   | 06/01/2020     | \$46.69   | \$7.70  | \$15.35 | \$0.00                       | \$69.74    |
|   | 12/01/2020     | \$47.67   | \$7.70  | \$15.35 | \$0.00                       | \$70.72    |
|   | 06/01/2021     | \$48.69   | \$7.70  | \$15.35 | \$0.00                       | \$71.74    |
|   | 12/01/2021     | \$49.70   | \$7.70  | \$15.35 | \$0.00                       | \$72.75    |
| For apprentice rates see "Apprentice- LABORER"                                      |                |           |         |         |                              |            |

| Classification   | Effective Date | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|---------------------------|------------|
| TUNNEL WORK - FREE AIR (HAZ. WASTE)<br><i>LABORERS (FREE AIR TUNNEL)</i> | 12/01/2017     | \$43.80   | \$7.70  | \$15.35 | \$0.00                    | \$66.85    |
|  | 06/01/2018     | \$44.75   | \$7.70  | \$15.35 | \$0.00                    | \$67.80    |
|  | 12/01/2018     | \$45.70   | \$7.70  | \$15.35 | \$0.00                    | \$68.75    |
|  | 06/01/2019     | \$46.70   | \$7.70  | \$15.35 | \$0.00                    | \$69.75    |
|  | 12/01/2019     | \$47.70   | \$7.70  | \$15.35 | \$0.00                    | \$70.75    |
|  | 06/01/2020     | \$48.69   | \$7.70  | \$15.35 | \$0.00                    | \$71.74    |
|  | 12/01/2020     | \$49.67   | \$7.70  | \$15.35 | \$0.00                    | \$72.72    |
|  | 06/01/2021     | \$50.69   | \$7.70  | \$15.35 | \$0.00                    | \$73.74    |
|  | 12/01/2021     | \$51.70   | \$7.70  | \$15.35 | \$0.00                    | \$74.75    |
| For apprentice rates see "Apprentice- LABORER"                           |                |           |         |         |                           |            |
| VAC-HAUL<br><i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE B</i>                 | 12/01/2016     | \$32.44   | \$10.91 | \$10.89 | \$0.00                    | \$54.24    |
| VOICE-DATA-VIDEO TECHNICIAN<br><i>ELECTRICIANS LOCAL 96</i>              | 12/01/2017     | \$29.04   | \$9.57  | \$12.92 | \$0.00                    | \$51.53    |
|  | 06/01/2018     | \$29.72   | \$9.82  | \$13.19 | \$0.00                    | \$52.73    |
|  | 12/01/2018     | \$29.87   | \$10.07 | \$13.20 | \$0.00                    | \$53.14    |
|  | 06/01/2019     | \$31.55   | \$10.07 | \$13.25 | \$0.00                    | \$54.87    |

**Apprentice - VOICE-DATA-VIDEO TECHNICIAN - Local 96**

**Effective Date - 12/01/2017**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$14.52              | \$9.57 | \$3.82  | \$0.00                    | \$27.91    |
| 2    | 55      | \$15.97              | \$9.57 | \$3.86  | \$0.00                    | \$29.40    |
| 3    | 60      | \$17.42              | \$9.57 | \$12.57 | \$0.00                    | \$39.56    |
| 4    | 65      | \$18.88              | \$9.57 | \$12.62 | \$0.00                    | \$41.07    |
| 5    | 70      | \$20.33              | \$9.57 | \$12.66 | \$0.00                    | \$42.56    |
| 6    | 75      | \$21.78              | \$9.57 | \$12.70 | \$0.00                    | \$44.05    |
| 7    | 80      | \$23.23              | \$9.57 | \$12.75 | \$0.00                    | \$45.55    |
| 8    | 85      | \$24.68              | \$9.57 | \$12.79 | \$0.00                    | \$47.04    |

**Effective Date - 06/01/2018**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$14.86              | \$9.82 | \$3.83  | \$0.00                    | \$28.51    |
| 2    | 55      | \$16.35              | \$9.82 | \$3.87  | \$0.00                    | \$30.04    |
| 3    | 60      | \$17.83              | \$9.82 | \$12.83 | \$0.00                    | \$40.48    |
| 4    | 65      | \$19.32              | \$9.82 | \$12.88 | \$0.00                    | \$42.02    |
| 5    | 70      | \$20.80              | \$9.82 | \$12.92 | \$0.00                    | \$43.54    |
| 6    | 75      | \$22.29              | \$9.82 | \$12.97 | \$0.00                    | \$45.08    |
| 7    | 80      | \$23.78              | \$9.82 | \$13.01 | \$0.00                    | \$46.61    |
| 8    | 85      | \$25.26              | \$9.82 | \$13.06 | \$0.00                    | \$48.14    |

**Notes:**

**Apprentice to Journeyworker Ratio:1:1**



| Classification  | Effective Date | Base Wage | Health  | Pension | Supplemental<br>Unemployment | Total Rate |
|---|----------------|-----------|---------|---------|------------------------------|------------|
| WAGON DRILL OPERATOR<br><i>LABORERS - ZONE 2</i>  | 12/01/2017     | \$33.08   | \$7.70  | \$13.60 | \$0.00                       | \$54.38    |
|   | 06/01/2018     | \$33.92   | \$7.70  | \$13.60 | \$0.00                       | \$55.22    |
|   | 12/01/2018     | \$34.76   | \$7.70  | \$13.60 | \$0.00                       | \$56.06    |
|   | 06/01/2019     | \$35.63   | \$7.70  | \$13.60 | \$0.00                       | \$56.93    |
|   | 12/01/2019     | \$36.49   | \$7.70  | \$13.60 | \$0.00                       | \$57.79    |
|   | 06/01/2020     | \$37.38   | \$7.70  | \$13.60 | \$0.00                       | \$58.68    |
|   | 12/01/2020     | \$38.27   | \$7.70  | \$13.60 | \$0.00                       | \$59.57    |
|   | 06/01/2021     | \$39.19   | \$7.70  | \$13.60 | \$0.00                       | \$60.49    |
|   | 12/01/2021     | \$40.10   | \$7.70  | \$13.60 | \$0.00                       | \$61.40    |
| For apprentice rates see "Apprentice- LABORER"  |                |           |         |         |                              |            |
| WASTE WATER PUMP OPERATOR<br><i>OPERATING ENGINEERS LOCAL 4</i>                                     | 12/01/2017     | \$46.63   | \$10.50 | \$15.50 | \$0.00                       | \$72.63    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"  |                |           |         |         |                              |            |
| WATER METER INSTALLER<br><i>PLUMBERS LOCAL 4</i>  | 03/01/2018     | \$43.96   | \$9.35  | \$14.91 | \$0.00                       | \$68.22    |
| For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"                    |                |           |         |         |                              |            |
| <b>Outside Electrical - East</b>  |                |           |         |         |                              |            |
| CABLE TECHNICIAN (Power Zone)<br><i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>                 | 09/03/2017     | \$27.14   | \$7.75  | \$1.81  | \$0.00                       | \$36.70    |
| For apprentice rates see "Apprentice- LINEMAN"  |                |           |         |         |                              |            |
| CABLEMAN (Underground Ducts & Cables)<br><i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>         | 09/03/2017     | \$38.45   | \$7.75  | \$9.53  | \$0.00                       | \$55.73    |
| For apprentice rates see "Apprentice- LINEMAN"  |                |           |         |         |                              |            |
| DRIVER / GROUNDMAN CDL<br><i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>                        | 09/03/2017     | \$31.66   | \$7.75  | \$9.44  | \$0.00                       | \$48.85    |
| For apprentice rates see "Apprentice- LINEMAN"  |                |           |         |         |                              |            |
| DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs)<br><i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i> | 09/03/2017     | \$24.88   | \$7.75  | \$1.75  | \$0.00                       | \$34.38    |
| For apprentice rates see "Apprentice- LINEMAN"  |                |           |         |         |                              |            |
| EQUIPMENT OPERATOR (Class A CDL)<br><i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>              | 09/03/2017     | \$38.45   | \$7.75  | \$13.61 | \$0.00                       | \$59.81    |
| For apprentice rates see "Apprentice- LINEMAN"  |                |           |         |         |                              |            |
| EQUIPMENT OPERATOR (Class B CDL)<br><i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>              | 09/03/2017     | \$33.92   | \$7.75  | \$10.21 | \$0.00                       | \$51.88    |
| For apprentice rates see "Apprentice- LINEMAN"  |                |           |         |         |                              |            |
| GROUNDMAN<br><i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>                                     | 09/03/2017     | \$24.88   | \$7.75  | \$1.75  | \$0.00                       | \$34.38    |
| For apprentice rates see "Apprentice- LINEMAN"  |                |           |         |         |                              |            |
| GROUNDMAN -Inexperienced (<2000 Hrs.)<br><i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>         | 09/03/2017     | \$20.35   | \$7.75  | \$1.61  | \$0.00                       | \$29.71    |
| For apprentice rates see "Apprentice- LINEMAN"  |                |           |         |         |                              |            |
| JOURNEYMAN LINEMAN<br><i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>                            | 09/03/2017     | \$45.23   | \$7.75  | \$16.61 | \$0.00                       | \$69.59    |

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|----------------|----------------|-----------|--------|---------|---------------------------|------------|
|----------------|----------------|-----------|--------|---------|---------------------------|------------|

**Apprentice - LINEMAN (Outside Electrical) - East Local 104**

**Effective Date - 09/03/2017**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 60      | \$27.14              | \$7.75 | \$3.31  | \$0.00                    | \$38.20    |
| 2    | 65      | \$29.40              | \$7.75 | \$3.38  | \$0.00                    | \$40.53    |
| 3    | 70      | \$31.66              | \$7.75 | \$3.45  | \$0.00                    | \$42.86    |
| 4    | 75      | \$33.92              | \$7.75 | \$5.02  | \$0.00                    | \$46.69    |
| 5    | 80      | \$36.18              | \$7.75 | \$5.09  | \$0.00                    | \$49.02    |
| 6    | 85      | \$38.45              | \$7.75 | \$5.15  | \$0.00                    | \$51.35    |
| 7    | 90      | \$40.71              | \$7.75 | \$7.22  | \$0.00                    | \$55.68    |

**Notes:**

**Apprentice to Journeyworker Ratio:1:2**

|   |            |         |        |        |        |         |
|---|------------|---------|--------|--------|--------|---------|
| TELEDATA CABLE SPLICER<br><i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>  | 01/01/2016 | \$28.98 | \$4.25 | \$3.12 | \$0.00 | \$36.35 |
| TELEDATA LINEMAN/EQUIPMENT OPERATOR<br><i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>   | 01/01/2016 | \$27.31 | \$4.25 | \$3.07 | \$0.00 | \$34.63 |
| TELEDATA WIREMAN/INSTALLER/TECHNICIAN<br><i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>   | 01/01/2016 | \$27.31 | \$4.25 | \$3.07 | \$0.00 | \$34.63 |
| TREE TRIMMER<br><i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>  | 01/31/2016 | \$18.51 | \$3.55 | \$0.00 | \$0.00 | \$22.06 |
| <p>This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is not on the ground.</p> <p>This classification does not apply to wholesale tree removal.</p> |            |         |        |        |        |         |
| TREE TRIMMER GROUNDMAN<br><i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>  | 01/31/2016 | \$16.32 | \$3.55 | \$0.00 | \$0.00 | \$19.87 |
| <p>This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is on the ground. This classification does not apply to wholesale tree removal.</p>            |            |         |        |        |        |         |

**Additional Apprentice Information:**

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)

Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

\*\* Multiple ratios are listed in the comment field.

\*\*\* APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.

\*\*\*\* APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

**DOCUMENT 00 85 00  
TAX PAYMENT CERTIFICATE  
(CITY OF WORCESTER DOCUMENT 00850)**

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**No General Bidder or Filed Sub-bidder will be eligible for a contract award unless the following certification has been completed and submitted to the Awarding Authority with its bid.**

CITY OF WORCESTER FORM  
OF  
TAX PAYMENT CERTIFICATE

STATE LAW NOW MANDATES THAT TO DO BUSINESS WITH THE CITY OF WORCESTER the Massachusetts Revenue Enforcement and Protection Program of 1983 requires that the following be supplied with your Bid:

Date: \_\_\_\_\_

Pursuant to M.G.L. Chapter 62C, Section 49A, I certify under the Penalties of Perjury That I, To My Best Knowledge and Belief, Have Filed ALL Massachusetts State Tax Returns and Paid ALL Massachusetts State and City Taxes Required under Law.

Company Name: \_\_\_\_\_

Street and Number: \_\_\_\_\_

City or Town: \_\_\_\_\_

State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Social Security Number or Federal Identification Number: \_\_\_\_\_

Is Company Certified by State Office of Minority and Women Business Assistance (SOMWBA)?

Yes \_\_\_\_\_ Date of Certification: \_\_\_\_\_

No \_\_\_\_\_

Failure to complete this form may result in rejection of Bid and/or removal from City Bid Lists.

\_\_\_\_\_  
BIDDER'S Authorized Signature

**END OF SECTION 00850**

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## IMPORTANT NOTICE TO BIDDERS

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**\*\* RESPONSIBLE EMPLOYER ORDINANCE**

and

**MINORITY/WOMEN BUSINESS ENTERPRISE AND WORKER UTILIZATION**

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**BIDDERS MUST COMPLETE FORMS EOO-101, REO-101, WAGE THEFT PREVENTION  
CERTIFICATION AND CORI COMPLIANCE. WHICH  
ARE PART OF THE BID SUBMISSION**

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GENERAL BIDDERS, PROPOSERS, TRADE CONTRACTORS, FILED SUBCONTRACTORS, AND NON-FILED SUBCONTRACTORS, AT EVERY TIER, MUST PROVIDE EVIDENCE OF COMPLIANCE WITH THE CITY OF WORCESTER'S RESPONSIBLE EMPLOYER ORDINANCE ("REO") (See, Supplementary General Conditions, Section 4.7).

**PLEASE SEE THE FOLLOWING PAGES FOR FURTHER REO REQUIREMENTS.**

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ALSO INCLUDED IN THIS SECTION IS A COPY OF THE AGREEMENT BETWEEN THE CITY AND THE MASSACHUSETTS COMMISSION AGAINST DISCRIMINATION THAT GOVERN THE ACTIVITIES ADDRESSED BY THE M/WBE BUSINESS ENTERPRISE AND WORKER UTILIZATION PROGRAM AND ITS ASSOCIATED FORMS CONTAINED HEREIN.

Direct any questions about these forms and procedures to:

Kerrilyn M. Marvill  
Contract Compliance Officer  
City Hall  
455 Main Street  
Worcester, MA 01608  
(508) 799-1220

\*\* This requirement applies to general bids over \$100,000 and all subcontractors at every tier exclusive of any pricing threshold.

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CITY OF WORCESTER  
INITIAL STATEMENT AND CERTIFICATION OF COMPLIANCE  
WITH THE RESPONSIBLE EMPLOYER ORDINANCE

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FORM REO 101 - PAGE 1 OF 2

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**PROJECT:****CONTRACTOR:**

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ALL GENERAL BIDDERS, PROPOSERS, TRADE CONTRACTORS, SUBCONTRACTORS, INCLUDING SUBCONTRACTORS THAT ARE NOT SUBJECT TO G.L. c. 149, § 44F, UNDER THE GENERAL BIDDER FOR PROJECTS SUBJECT TO G.L. c. 149, § 44A(2) OR UNDER PROPOSERS FOR PROJECTS SUBJECT TO G.L. c. 149A, SHALL AS A CONDITION TO SUBMITTING A BID OR A PROPOSAL, OR OTHERWISE AS A CONDITION TO SUBCONTRACTING, VERIFY COMPLIANCE WITH THE FOLLOWING OBLIGATIONS AND SHALL CERTIFY SUCH COMPLIANCE ON A WEEKLY BASIS FOR THE DURATION OF THE PROJECT:

- 1) That the appropriate lawful Prevailing Wage Rates shall be paid to all employees and the Weekly Payroll Report Form and Statement of Compliance shall be submitted to the Contract Compliance Office on a weekly basis for the entire duration of the project; **{COMPLIANCE WITH THE APPRENTICE TRAINING PROVISION OF THE RESPONSIBLE EMPLOYER ORDINANCE IS CURRENTLY SUSPENDED}**
- 2) That appropriate industrial accident insurance coverage shall be furnished and maintained, for the duration of the project, for all its employees employed on the project in accordance with M.G.L. c. 152;
- 3) That the contractor/company will properly classify employees on the project as employees rather than independent contractors and treat them accordingly for purposes of workers' compensation insurance coverage, unemployment taxes, social security taxes and income tax withholding. (G.L. c.149, §148B on employee classification);
- 4) That at the time employees begin work at the worksite, each employee will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration;
- 5) That the contractor/company is in compliance with the health and hospitalization requirements of the Massachusetts Health Care Reform law established by Chapter 58 of the Acts of 2006, as amended, and regulations promulgated pursuant to that statute by the Commonwealth Health Insurance Connector Authority;
- 6) That the contractor/company, for the duration of the contractor's/company's work on the project, shall make arrangements to ensure that each of its employees entering or leaving the project

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CITY OF WORCESTER  
INITIAL STATEMENT AND CERTIFICATION OF COMPLIANCE  
WITH THE RESPONSIBLE EMPLOYER ORDINANCE

FORM REO 101 - PAGE 2

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PROJECT:

CONTRACTOR:

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individually completes the appropriate entries in a daily sign-in/sign-out log to be maintained by the contractor/company;

- 7) That the contractor/company is not debarred or otherwise prevented from bidding for or performing work on a public project in the Commonwealth of Massachusetts or in the city of Worcester

THE UNDERSIGNED ACKNOWLEDGES HE/SHE HAS READ THE ABOVE OBLIGATIONS AND CERTIFIES THE CONTRACTOR'S COMPLIANCE WITH THEM.

Signed as a True Statement under Oath:

\_\_\_\_\_  
(Bidder/Company)

By: \_\_\_\_\_  
(Name/Signature)

Date: \_\_\_\_\_

By: \_\_\_\_\_  
(Print Name and Corporate Title)

(Seal)

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**CITY OF WORCESTER  
RESPONSIBLE EMPLOYER ORDINANCE REQUIREMENTS (CONT'D)****FORM REO 103  
PAGE 1 OF 1**

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**PROJECT:****CONTRACTOR:**

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**POST CONTRACT AWARD SUBMISSIONS**

THE SUCCESSFUL GENERAL CONTRACTOR, CONSTRUCTION MANAGER AT RISK, TRADE CONTRACTORS AND SUBCONTRACTORS, INCLUDING SUBCONTRACTORS THAT ARE NOT SUBJECT TO G.L. c. 149, §44F, UNDER THE GENERAL CONTRACTOR FOR PROJECTS SUBJECT TO G.L. c. 149, §44A(2) OR UNDER THE CONSTRUCTION MANAGER AT RISK FOR PROJECTS SUBJECT TO G.L. c. 149A, SHALL SUBMIT THE FOLLOWING INFORMATION AS OUTLINED BELOW FOR THE DURATION OF THE PROJECT:

- 1, PRIOR TO EACH EMPLOYEE BEGINNING WORK AT THE WORKSITE, SUBMIT DOCUMENTATION EVIDENCING THE EMPLOYEE'S SUCCESSFUL COMPLETION OF A COURSE IN CONSTRUCTION SAFETY AND HEALTH THAT IS APPROVED BY THE UNITED STATES OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION. A QUALIFYING PROGRAM MUST BE A MINIMUM OF TEN HOURS IN DURATION.
2. ON A DAILY BASIS, SUBMIT DAILY SIGN-IN/SIGN-OUT LOGS THAT HAVE BEEN FILLED OUT BY EACH INDIVIDUAL EMPLOYEE ENTERING OR LEAVING THE WORKSITE. THE LOG SHALL INCLUDE THE FOLLOWING: THE LOCATION OF THE PROJECT; CURRENT DATE; PRINTED EMPLOYEE NAME; SIGNED EMPLOYEE NAME; AND THE TIME OF EACH ENTRY OR EXIT. THE LOG SHALL ALSO INCLUDE A PROMINENT NOTICE THAT EMPLOYEES ARE ENTITLED UNDER STATE LAW TO RECEIVE THE PREVAILING WAGE RATE FOR THEIR WORK ON THE PROJECT.

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**MINORITY/WOMEN BUSINESS ENTERPRISE AND WORKER UTILIZATION**

FORM EOO-D/102

**BIDDERS INFORMATION ON PROCEDURES AND FORMS**

To make all contractors aware of their obligation to follow certain procedures and file appropriate reports pertaining to those procedures, the following is an outline of the Minority/Women Business Enterprise and Worker Utilization Program. Also included here is the Affidavit of Acknowledgement and Certification of Compliance, Form E00-101. This form is to be completed and filed as part of your bid.

The following documents are included in this bid:

1. **AFFIDAVIT OF ACKNOWLEDGEMENT AND CERTIFICATION OF COMPLIANCE, E00-101**

General Contractors, Trade Contractors, Filed Subcontractors and Non-Filed Subcontractors complete and submit this form as part of their bid on all City of Worcester construction projects.

Each additional subcontractor shall complete this form and submit it to the general contractor who shall forward it to the Contract Compliance Office, **PRIOR** to the subcontractor's beginning work on the project.

2. **SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY ANTI-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM E00-D/3**

The agreement between the City of Worcester and the Massachusetts Commission Against Discrimination establishing the goals and procedures for the utilization of minority and women owned businesses and minority and women workers on City Construction projects.

3. **SUCCESSFUL BIDDER'S OBLIGATION TO PROCEDURES AND FORMS, EOO-D/103**

This is a listing of the procedures and forms that will be provided to the successful bidder for use prior to beginning work and at various times throughout the life of the project.

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**CITY OF WORCESTER**  
**MINORITY/WOMEN BUSINESS ENTERPRISE AND WORKER UTILIZATION PROGRAM**

**AFFIDAVIT OF ACKNOWLEDGEMENT and CERTIFICATE OF COMPLIANCE**

**FORM EOO-101**

**TO ALL CONTRACTORS:**

The Bidder or Proposer and all Trade Contractors and Subcontractors under the Bidder or Proposer must complete and submit this form as part of their bid.

**I. THE MINORITY AND WOMEN BUSINESS AND UTILIZATION PROGRAMS**

Pursuant to an agreement between the City of Worcester and the Commonwealth of Massachusetts, during the performance of any contract with the City of Worcester, all General Contractors, Trade Contractors, Filed Subcontractors, and Subcontractors are bound by the obligations of the Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program. All contractors and subcontractors if subcontracting any portion of the work are obligated to make a good faith effort to engage 10% minority and 5% women owned businesses. Further, each contractor shall make a good faith effort to maintain a workforce that is 10% minority and 5% women.

The undersigned hereby certifies that he/she is familiar with the provisions of The Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Programs and agrees to adhere to the provisions therein.

**II.** This contractor IS ☐ or IS NOT ☐ certified by the State Office of Minority and Women Business Assistance to be a minority or women owned and operated business; and

**III.** WILL ☐ or WILL NOT ☐ subcontract any portion of this contract.

Project Name: \_\_\_\_\_ Bid Number \_\_\_\_\_

Authorized Signature: \_\_\_\_\_ Business Name \_\_\_\_\_

Printed Name: \_\_\_\_\_ Title: \_\_\_\_\_

Address: \_\_\_\_\_ Date: \_\_\_\_\_



**WAGE THEFT PREVENTION CERTIFICATION**

By the Revised Ordinances, Chapter 2, Section 39, the city of Worcester has established requirements for certain contracts in an effort to prevent wage theft. Prospective contractors must provide the following certification and disclosures with their bids/proposals. The City will not award a contract without receipt of this completed certification.

**INSTRUCTIONS:** A prospective contractor shall **(a)** check Box 1 *OR* Box 2, as applicable, **(b)** check Boxes 3-5, **(c)** sign this form certifying compliance with the Wage Theft Prevention Ordinance, and **(d)** submit the completed form with its bid/proposal. For multi-year contracts, the successful bidder/proposer shall submit the completed form annually to the Purchasing Director.

Pursuant to the Wage Theft Prevention Ordinance, successful bidders/proposals shall post in conspicuous places the Mass. Wage and Hour Laws notice informing employees of the protections of G.L. c. 149, Sec. 151, and the Fair Labor Standards Act (FLSA). The notice may be found at <http://www.mass.gov/ago/docs/workplace/wage/wagehourposter.pdf>

ALL BIDDERS/PROPOSERS MUST CERTIFY THAT [check either Box 1 or Box 2, as applicable]

1. ☐ Neither this vendor/contractor nor any prospective subcontractor has been subject to a federal or state criminal or civil judgment, administrative citation, final administrative determination, order or debarment resulting from a violation of G.L. c. 149, G.L. c. 151, or FLSA, within three (3) years prior to the date of this bid/proposal submission.

OR

2. ☐ This vendor/contractor, or a prospective subcontractor, has been subject to a federal or state criminal or civil judgment, administrative citation, final administrative determination, or debarment resulting from a violation of G.L. c. 149, G.L. c. 151, or FLSA, within three (3) years prior to the date of this bid/proposal submission. The firm shall provide a copy of the same with the bid/proposal.

ALL BIDDERS/PROPOSERS MUST CERTIFY EACH OF THE FOLLOWING

3. ☐ Within five (5) days of receiving notice, the vendor/contractor shall report and provide a copy of any federal or state criminal or civil judgment, administrative citation, final administrative determination, order or debarment resulting from a violation of G.L. c. 149, G.L. c. 151, or FLSA imposed on this firm or on any prospective subcontractor while any bid/proposal to the City is pending and, if awarded a contract, during the term of the contract provide the same to the Purchasing Director.

4. ☐ A vendor/contractor awarded a contract that has disclosed under paragraph 3 above shall, upon request, furnish monthly certified payrolls for the City contract as the Purchasing Director instructs and shall, at the discretion of the Purchasing Director, obtain a wage/payment bond or other suitable insurance as required by the Wage Theft Prevention Ordinance. Vendors/contractors subject to a state or federal debarment for violation of the above laws or prohibited from contracting with the Commonwealth are prohibited from contracting with the City, and upon a finding or order of debarment or prohibition, the City may terminate the contract.

5. ☐ The contractor shall post notices provided by the City in conspicuous places informing employees of the protections of the Wage Theft Prevention Ordinance, and applicable local, state and federal law.

The undersigned certifies under the pains and penalties of perjury that the contractor is in compliance and agrees to remain in compliance with the provisions of the Wage Theft Prevention Ordinance for the term of its contract with the City.

Signed: \_\_\_\_\_  
Print Name & Title Company Name Date

**CORI COMPLIANCE / GENDER IDENTITY & EXPRESSION**

Vendors entering into contracts with the City of Worcester must affirm that their policies regarding CORI information are consistent with the CORI hiring standards set by the City of Worcester. The City's CORI hiring policy may be downloaded from City of Worcester website [www.worcesterma.gov](http://www.worcesterma.gov). Questions pertaining to the City's CORI hiring policy are to be directed to the Equal Employment Opportunity Officer, Executive Office of Human Resources at 508-799-1030.

**CERTIFICATION**

**All Vendors must check one of the three lines below.**

1. ☐ CORI checks are not performed on any Applicants.
2. ☐ CORI checks are performed on some or all Applicants. The Vendor, by affixing a signature below, affirms under penalties of perjury that its CORI policy is consistent with the standards set forth with the CORI hiring standards set by the City of Worcester.
3. ☐ CORI checks are performed on some or all Applicants. The Vendor's CORI policy is not consistent with the standards set forth with the CORI hiring standards set by the City of Worcester. (a copy of the Vendor's written CORI policy must accompany this form).

\_\_\_\_\_  
(Typed or printed name of person  
signing quotation, bid or proposal)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name of Business

A Vendor with a CORI policy that does NOT conform to the City standards must check Line 3. Vendors who check Line 3 will not be permitted to enter into contracts with the City, absent a waiver granted by the City. For any waiver to be granted, a written request should accompany bid submission explaining in detail why the vendor fails or refuses to comply with the City's CORI hiring standards.

**Gender Identity Standards Applicable to Vendors**

The city will do business only with vendors that have adopted and employ Gender Identity policies, practices and standards that are consistent with city standards.

The city may review all vendors' Gender Identity policies and practices for consistency with city standards.

By signing this bid, vendor confirms that their Gender Identity policies, practices and standards are consistent with those of the City of Worcester. For further information please refer to the Ordinance Relative to Gender Identity and Expression found at [www.worcesterma.gov](http://www.worcesterma.gov) or call the LGBTQ Liaison/Director of Human Rights & Disabilities at 508-799-8486.

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**THE CITY OF WORCESTER****SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY ANTI-DISCRIMINATION AND AFFIRMATIVE ACTION PROGRAM****I. AGREEMENT**

During the performance of this contract, the Contractor or Filed Subcontractor and all subcontractors (herein collectively referred to as the Contractor), for himself/herself, his/her assignees, and successors in interest, agree as follows:

1. In conjunction with the performance of work under this contract, the contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, age, sex, or handicap. The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion, or transfer; recruitment advertising; layoff; termination, rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship. The contractor shall post hereafter in a conspicuous place, available to employees and applicants for employment, notices to be provided by the Commission setting forth the provisions of the Fair Employment Practices Law of the Commonwealth (M.G.L. Chapter 151 B).
2. In connection with the performance of work under this contract, the Contractor shall undertake in good faith affirmative action measures designed to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, age, sex, or handicap, and to eliminate and remedy any effects of such discrimination in the past. Such affirmative action shall entail positive and aggressive measures to ensure equal opportunity in the areas of apprenticeship training programs. This affirmative action shall include all action required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, age, sex, or handicap. The purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradesmen for this and future City public construction projects.

**II. OBLIGATION**

1. As part of the obligation of remedial action under the foregoing section, the Contractor shall maintain goals on this project no less than 10 percent (10%) minority employee and 5 percent (5%) women employee hours of the total work hours in each job category including but not limited to, bricklayers, carpenters, cement masons, electricians, iron workers, operating engineers, and those "classes of work" enumerated in section 44C of chapter 149 of the Massachusetts General Laws.
2. In the hiring of minority and women journeymen, apprentices, trainees and advanced trainees, the Contractor shall rely on referrals from a multi-employer affirmative action program approved by the City, traditional referral methods utilized by the construction industry, and referrals from agencies, not more than three in number at any one time, designated by the City.

### III. REPORTS

1. Contractor shall prepare projected manning tables on a quarterly basis, **Quarterly Projected Workforce Table, E00-105**. These shall be broken down into projections by week, for workers required in each trade. Copies shall be furnished to the City one week in advance of the commencement of the period covered, and at such time as there is a need to be updated during the period.
2. Records of employment referral orders, prepared by the Contractor, shall be made available to the City on request.
3. The Contractor shall prepare the **Certified Payroll Report on a weekly basis**, which lists the hours worked in each trade by each employee identified as minority, non-minority, male and female. Copies of these shall be provided to the City at the end of each week.

### IV. SUBCONTRACTING WORK

If the Contractor shall use any Subcontractor on any work performed under this contract, affirmative action shall be taken to negotiate with qualified minority and women contractors. This affirmative action shall cover both pre-bid and post-bid periods.

### V. EMPLOYMENT

In the employment of journeymen, apprentices, trainees, and advanced trainees, the Contractor shall give preference, first to citizens of the Commonwealth who have served in the armed forces of the United States in time of war and have been honorably discharged there from or released from active duty therein, and who are qualified to perform the work to which the employment relates, and, secondly, to citizens of the Commonwealth generally, and, if such cannot be obtained in sufficient numbers, then to citizens of the United States.

### VI. RIGHT OF ACCESS

A designee of the City shall have the right of access to the construction site.

### VII. COMPLIANCE WITH REQUIREMENTS

The contractor shall comply with the provisions of Executive Order No. 227 amending and revising Executive Order No. 74, as amended by executive Order No. 16 dated May 1, 1975 and of Chapter 151B as amended, of the Massachusetts General Laws, both of which are herein incorporated by reference and made part of this contract.

### VIII. NON-DISCRIMINATION

The Contractor, in the performance of all work after the award, and prior to completion of the contract work, will not discriminate on the grounds of race, color, religious creed, national origin, age, sex, or handicap in employment practices, in the selection or retention of other contractors or in the procurement of materials and rentals of equipment.

**IX. SOLICITATIONS FOR SUBCONTRACTORS, AND FOR THE PROCUREMENT OF MATERIALS AND EQUIPMENT**

In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or supplies, each entity solicited shall be notified in writing by the contractor of the Contractor's obligation under this contract relative to non-discrimination and affirmative action.

**X. CONTRACTOR'S CERTIFICATION**

Contractors bidding as General Contractors or Filed Sub-contractors shall certify that they will comply with the minority and women manpower and business enterprise goals and specific affirmative action steps contained in this Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program by signing and submitting with the bid the **Affidavit of Acknowledgement and Certification of Compliance, Form E00-101**.

**If any Contractor subcontracts any portion of the work, the Contractor is required to obtain from each Subcontractor, regardless of tier, an Affidavit of Acknowledgement and Certification of Compliance, Form E00-101 stating that it will comply with the minority and women subcontracting and manpower ratios and specific affirmative action steps contained in this Supplemental Equal**

Employment Opportunity Anti-Discrimination and Affirmative Action Program by signing this form and submitting it to the Contractor for submission to the awarding authority not later than five working days following the opening of the bids.

**XI. COMPLIANCE – INFORMATION, REPORTS, AND SANCTIONS**

1. The Contractor will provide all information and reports required by the City on instructions issued and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the City to affect the employment of personnel. This provision shall apply only to information pertinent to the City's supplementary affirmative action contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the City and shall set forth what efforts have been made to obtain the information.
2. Whenever the City believes the Contractor may not be operating in compliance with the terms of this Section, the City directly, or through its designated agent, shall conduct an appropriate investigation, and confer with the parties, to determine if such Contractor is operating in compliance with the terms of this Section. If the City or its agent finds the Contractor not in compliance, it shall make a preliminary report of non-compliance and notify such Contractor in writing of such steps as will in the judgment of the City or its agent bring such Contractor into compliance. In the event that such Contractor fails or refuses to fully perform such steps, the City shall make a final report of non-compliance, and recommend the imposition of one or more of the sanctions listed below. If, however, the City believes the Contractor has taken or is taking every possible measure to achieve compliance, it shall not make final a report on non-compliance. Within fourteen (14) days of the receipt of recommendations of the City, the

administering agency shall move to impose one or more of the following sanctions, as it may deem appropriate to attain full and effective enforcement.

- a. The recovery by the administering agency from the Contractor of 1/10 of 1% of the contract award price or \$1000.00, whichever sum is greater, in the nature of liquidated damages or, if a Subcontractor is in non-compliance, the recovery by the administering agency from the Contractor as a back charge against the Subcontractor of 1/10 of 1% of the subcontract price, or \$400.00, whichever sum is greater, in the nature of liquidated damages, for each week that such party fails or refuses to comply;
  - b. The suspension of any payment or part thereof due under the contract until such time as the Contractor or any Subcontractor is able to demonstrate compliance with the terms of the contract;
  - c. The termination, or cancellation, of the contract, in whole or in part, unless the Contractor is able to demonstrate within a specified time his compliance with the terms of the contract;
  - d. The denial to the Contractor of the right to participate in any further contracts awarded by the administering agency for a period of up to three years.
3. If at any time after the imposition of one or more of the above sanctions a Contractor is able to demonstrate that he/she is in compliance with this section, he/she may request the administering agency in consultation with the City, to suspend the sanctions conditionally, pending a final determination by the City as to whether the contractor is in compliance. Upon final determination, based on the recommendations of the adjudicatory body, the City shall either lift the sanctions or reimpose them.
4. Sanctions enumerated under Section XII-2 shall not be imposed except after an adjudicatory proceeding, as that term is used in M.G.L. Chapter 30, has been conducted. No investigation by the City or its agent shall be initiated without prior notice to the Contractor.

## **XII. SEVERABILITY**

The provisions of this Section are severable, and if any of these provisions shall be held unconstitutional by any court of competent jurisdiction, the decisions of such court shall not affect or impair any of the remaining provisions.

## **XIII. WAIVER**

The City of Worcester reserves the right to waive any stipulation in the M/WBE Program when deemed necessary or appropriate for the general good of the City and its programs.

## **DEFINITIONS**

Contractor - Except where otherwise specifically stated the term "Contractor" shall mean any General Contractor

City - is the City of Worcester, Massachusetts

M/WBE – is A Minority and Women Business Enterprise as certified by the State Office of Minority and Women Business Assistance to be 51% or more minority or women owned and operated.



**RESPONSIBLE EMPLOYER ORDINANCE**  
and  
**MINORITY/WOMEN BUSINESS ENTERPRISE AND WORKER UTILIZATION**

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FORM E00-D/103

**SUCCESSFUL BIDDER'S OBLIGATION TO PROCEDURES AND FORMS**

All successful bidders on City of Worcester construction projects will receive a package of procedures and forms that are to be used at specific times throughout the life of the project.

The following is a list of the documents that will be sent to successful bidders when this office is notified that a contract has been, or is about to be, executed.

**I. BUILDING TRADES – CONTACT LIST, E00-D/6**

When a contractor cannot fulfill the worker utilization percentages, the appropriate building trades locals may be contacted to request assistance in locating and engaging qualified workers.

**II. AFFIDAVIT OF ACKNOWLEDGEMENT and CERTIFICATION OF COMPLIANCE, (FOR SUBCONTRACTORS), E00-101**

If any portion of a project is to be subcontracted at any tier, each additional subcontractor shall complete this form and send it to the Contract Compliance Office within two business days of contract execution and PRIOR to beginning work on the project.

**III. TABLE OF PROJECTED SUBCONTRACTORS, E00-103**

The use of subcontractors at any tier shall be reported to the Contract Compliance Office on this form prior to the subcontractor beginning work on the project.

**IV. SUBCONTRACTOR'S CERTIFICATE OF INTENT TO PARTICIPATE, E00-104**

Each Non-Filed subcontractor engaged to work a project shall complete and forward this form to the Contract Compliance Office prior to beginning work on the project.

**V. QUARTERLY PROJECTED WORKFORCE TABLE, E00-105**

Each General Contractor, Filed Subcontractor and Non-Filed Subcontractor, regardless of tier, shall complete and forward this form to the Contract Compliance Office prior to beginning work and again for each additional three month period throughout the life of the project.

**VI. REQUEST FOR MODIFICATION**

**E00-106B, MINORITY AND WOMEN BUSINESS UTILIZATION**

**E00-106C, MINORITY AND WOMEN UTILIZATION IN THE WORK FORCE**

Any General Contractor, Filed Subcontractor or Non-Filed Subcontractor, regardless of tier, not meeting the minority and women goals, may file a request for modification after having exhausted all possible sources.

Requests for modification are considered ONLY after attempts to fulfill these mandates have been documented and submitted to the Contract Compliance Office with the appropriate sections of this form.

A modification or waiver will not be granted because a contractor wishes to use an existing workforce that does not achieve the goals of 10% of total work hours to be worked by minorities and 5% of total work hours to be worked by women; and,

If subcontracting, does not meet the goals of 10% of the contract value for Minority Business Enterprises and 5% of the contract value to Women Business Enterprises.

**VII. INITIAL STATEMENT and CERTIFICATION OF COMPLIANCE WITH THE RESPONSIBLE EMPLOYER ORDINANCE, REO-101 (Pages 1 & 2)**

General Contractors, Trade Contractors, Filed Subcontractors and Subcontractors complete and submit this form as part of their bid on all City of Worcester construction projects subject to the provisions of G.L. Chapter 149 and Chapter 149A.

The REO requirements are applicable under Chapter 149 to contracts of \$100,000 or more. Under Chapter 149A the requirements are applicable only to contracts \$5M and above.

Note: Under the September 2012 revision of the REO, there is no minimum threshold for subcontractors. Hence all subcontractors, i.e., Trade Contractors, Filed Subcontractors and Non-Filed Subcontractors at every tier must comply with the requirements of the REO

The General Contractor shall forward all Trade Contractor's, Filed Subcontractor's and Subcontractor's REO-101 Forms and REO evidence to the Contract Compliance Office for approval, PRIOR to said subcontractors beginning work.

**VIII. WEEKLY STATEMENT AND CERTIFICATION OF COMPLIANCE WITH THE RESPONSIBLE EMPLOYER ORDINANCE, REO-102**

At the end of each week of work, ALL Contractors, Trade Contractors, Filed Subcontractors, and Non-Filed Subcontractors regardless of tier, subject to the provisions of G.L. Chapter 149 and Chapter 149A, shall complete and submit this form along with their certified payroll reports to the Contract Compliance Office.

**IX. INITIAL STATEMENT AND ADDITIONAL CERTIFICATION OF COMPLIANCE WITH THE RESPONSIBLE EMPLOYER ORDINANCE, REO-103**

General Contractors, Trade Contractors, Filed Subcontractors and Subcontractors complete and submit this form as part of their bid on all City of Worcester construction projects subject to the provisions of G.L. Chapter 149 and Chapter 149A.

If any portion of a project is to be subcontracted at any tier, each additional subcontractor shall complete this form and send it to the General Contractor who, in turn will transmit this form to the Contract Compliance Office within two business days of contract execution and PRIOR to the subcontractor beginning work on the project.

**SOUTH HIGH COMMUNITY SCHOOL  
DOCUMENT 009500 REO & MBE/WBE & WORKER UTILIZATION**

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**X. WEEKLY CERTIFIED PAYROLL REPORT and WEEKLY  
WORKFORCE UTILIZATION REPORT.**

At the end of each week of work, all Contractors, Filed Subcontractors, and Non-Filed Subcontractors, regardless of tier, shall complete and submit these forms to the Contract Compliance Office.

The Contract Compliance Office will also accept computer generated payroll reports. However, if the computer payroll does not reflect the prevailing wage, the Contractor must provide a breakdown of the benefits paid to each employee which when added to the base wage equals the prevailing wage.

**END OF SECTION 009500**

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Section 01 10 00  
SUMMARY

PART 1 - GENERAL

1.1 Summary

- a. Project description.
- b. Project's environmental goals.
- c. Hazardous materials.
- d. Definitions – Owner, Owner's Project Manager, Construction Manager and Architect.
- e. Work by Owner.
- f. Owner early occupancy.
- g. Project Manual formats and conventions.

1.2 Project description

- a. Work covered by Contract Documents: Early Site Enabling Bid Package #1. The scope of work for this package includes the following items as indicated on the Drawings:
  - 1. Install and maintain erosion controls throughout the site.
  - 2. Construct paved construction access road (including related segmental retaining wall, drainage, plantings and permanent fencing) from Apricot Street around SW side of existing building.
  - 3. Construct stabilized construction entrances at Apricot Street and at end of lower Sullivan MS parking lot.
  - 4. Construct temporary parking, drainage and accessible route/entry in existing bus loop area.
  - 5. Salvage and store or relocate existing memorial plaques, stone markers, benches, playground equipment, plantings, flag pole and utility poles.
  - 6. Construct paved temporary parking at west edge of existing lower Sullivan MS lot.
  - 7. Construct temporary parking, bus turn-around, drainage and accessible route/entry at NW side of existing building.
  - 8. Cut/cap existing water service and provide new fire hydrant near NW corner of building.
  - 9. Demolish miscellaneous existing site improvements including site drainage, fencing and gates, planters, paving, trees and shrubs, concrete barriers and stone retaining wall.
  - 10. Provide construction fencing, gates, temporary barriers, temporary stair, project sign, directional signage, etc. for return of students and staff/faculty in August 2018.
  - 11. Provide temporary lighting in areas to be utilized by the School District including parking lots, driveways, sidewalks and pathways.
  - 12. Mobilize onsite and provide temporary facilities.
  - 13. Provide as-built documents of completed Site Enabling Bid Package construction.
  - 14. Other:
    - a) Work included beyond the Contract Limits: Protection and replacement of abutting sidewalks and roadways in public way, and on adjacent properties.
    - b) Completeness: The Work shall be as shown on the Drawings and be complete in

every respect and in conformance with all applicable requirements of the governing laws and codes.

b. Schedule:

1. Contract time: The Construction Manager may begin on-site work on, or after receipt of a written Notice to Proceed, or suitable Letter of Intent. After commencement of work, the Construction Manager shall pursue the Work continuously and with diligence, and bring the Project to Substantial Completion prior to date stipulated in Owner-Construction Manager Agreement.
2. Refer to the Construction Manager's instructions to bidders for bid due date.
3. The site will be available to the Contractor on June 22, 2018, or the day after the last day of school, whichever is later.
4. The work shall be substantially complete by August \_\_, 2018, or the first day of school, whichever is earlier.
  - a) Substantial completion is the stage in the progress of the Work when the work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use. This includes any and all permits required by governmental agencies necessary for occupancy and use.
5. Permitting with the Worcester Conservation Commission is ongoing and it is anticipated that an Order of Conditions will be issued prior to June 22, 2018.
6. Construction documents for Sitework Bid Package #2, the scope of which includes all remaining Sitework besides this package, are expected to be issued for bidding on August 30, 2018.
7. Construction documents for Structural Bid Package #3, the scope of which includes all concrete foundations and structural steel, are expected to be issued for bidding on November 22, 2018.
8. Construction documents for Trade Contractor Bid Package #4, the scope of which includes all remaining work, are expected to be issued for bidding on January 17, 2019.

c. Project Address:

South High Community School  
170 Apricot Street  
Worcester, MA 01603

- d. Building Permits: Construction Manager is responsible to ensure all required permits are obtained, and that the work pertaining to permits is properly inspected and certified. Trade Contractors are required to obtain permits relating to their work.
- 1). Building permit fees have been waived by the City of Worcester. Individual permit fees associated with the work of Trade Contractors and subcontractors are the responsibility of the Trade Contractor performing the work of in the case of subcontractors the Construction Manager.

- 2). All costs associated with utility charges related to the construction of the building are the responsibility of the Construction Manager including but not limited to electrical, water and sewer, natural gas, etc.

### 1.3 Project Environmental Goals

- a. Overview of the environmental requirements for the Project: The Owner has established the environmental goal to construct a "green" building integrating the Owner's environmental operational mission into the Project.
  - 1). The Owner's environmental goals for the Project includes participation in the LEED™ (Leadership in Energy and Environmental Design) Program for "SILVER" Certification under the United States Green Building Council's LEED Rating System, LEED v.4 S (Schools).
    - a). Refer to Section 01 81 13 - SUSTAINABLE DESIGN REQUIREMENTS regarding special administrative and procedural requirements related the Owner's LEED goals.
    - b). Individual Specification Sections have additional detailed requirements.

### 1.4 DEFINITIONS – OWNER, Owner's Project Manager, Architect, and construction manager

- a. Wherever the term "Owner" is used in this specification, it refers to:

City of Worcester  
455 Main Street, Room 309  
Worcester, Massachusetts 01608
- 1). The terms "Owner" and "Awarding Authority" as used in the Project Manual have the same meaning and are interchangeable in Contract Documents. Both terms refer to the same entity.
- 2). Important Tax Note: OWNER is a non-profit organization and exempt from certain taxes. It is therefore required that the Construction Manager and all Subcontractors purchasing taxable goods or services make known to suppliers that tax-exempt status of the Owner, in order that such taxes will not be applied to the goods under Contract. In the event that such taxes are paid on any items, the Construction Manager shall obtain rebates for the taxes and reimburse the Owner in the full amount by change order. The Owner will provide the necessary evidence and certificates of its tax-exempt status upon request of those concerned. The most prevalent taxes concerned are:
  - a). Federal Excise Taxes as applied to articles which are taxable under Chapter 32 of the Internal Revenue Code of 1954, as amended. The Owner's Excise Tax Exemption Certificate Number is applicable.
  - b). Sales and Use Tax imposed by the Commonwealth of Massachusetts: The Owner has been assigned Exemption Certificate Number E-046-001-076 with respect to leases, rental, or purchase of "tangible personal property", including building materials and supplies, subject to the Massachusetts Sales and Use Tax. This exemption does not apply to any equipment leased or rented by the Construction Manager for his own use on the construction of the Project.
  - c). Sales and Use Tax imposed by the states where the Owner does not have exemption status: The Owner may choose to apply for tax exemption status in other states where major building materials and supplies are being purchased. In the event that the Owner obtains exemption status after bids are received, the Construction Manager shall adjust the Stipulated Sum by change order, for the

amount equal to the scheduled taxes that were included in the Construction Managers Bid.

- d). Fines and Penalties: Construction Manager and subcontractors are fully responsible for payment of all penalties and fines assessed by authorities having jurisdiction for improper and illegal use of Owner's tax exemption certificate number.
- 3). All papers required to be delivered to the Owner shall, unless otherwise specified in writing to the contrary, be delivered to the office of the Architect:
- b. Wherever the term "Owner's Project Manager" is used in the Contract Documents, it refers to:
  - CBRE/Heery
  - 80 Blanchard Road, Suite 108
  - Burlington, Massachusetts 01803
- c. Wherever the term "Architect", "Designer", or "Architect/Engineer", is used in the Contract Documents, it refers to:
  - Lamoureux Pagano & Associates
  - 108 Grove Street, Suite 300
  - Worcester, Massachusetts 01605
- d. Wherever the term "Construction Manager", "Contractor, or "General Contractor", is used in the Contract Documents, it refers to:
  - Fontaine Brothers Inc.
  - 510 Cottage Street
  - Springfield, Massachusetts 01104
- 1). The terms "Construction Manager", "General Contractor" and "Contractor" as used in the Project Manual have the same meaning and are interchangeable in Contract Documents. Both terms refer to the same entity.

#### 1.5 Work by Owner

- a. Related work under separate agreements: The Owner will award a separate contract which will commence prior to or during the work of this Contract; which in general includes:
  - 1). Testing Laboratory Services.
- b. Owner Furnished - Construction Manager Installed (OFCI) Products: The Construction Manager shall install the following Owner furnished items.
  - 1). NA
- c. Owner Furnished and Installed (OFI) Products: The Construction Manager has coordinating responsibility for the following work, provided by others under separate agreement(s) with the Owner:
  - 1). NA

#### 1.6 Products requiring long lead time

- a. Several products specified in individual specification sections are "long lead time" products and thus require advance ordering. For the following categories of work, affirm early purchase orders under the requirements of Section 01 32 00 – Construction Progress Documentation.
  - 1). Segmental retaining wall



## 1.7 PROJECT MANUAL FORMATS AND CONVENTIONS

- a. Project Manual Format: The Project Manual is organized into Divisions and subdivided into Sections and Documents using Construction Specification Institute (CSI) publication "MasterFormat, 2004 Edition" numbering system.
  - 1). Section Identification: Six/Eight digit Section numbers are utilized and cross-referenced throughout the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because only those Section numbers which are applicable to this Project are used.
  - 2). Division One of the Project Manual governs procedural and administrative requirements of the Work. Division One requirements are applicable to all Sections and Documents in the Project Manual.
- b. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1). Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular as applicable to the context of the Contract Documents.
  - 2). Imperative mood and streamlined language is generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Construction Manager. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Construction Manager or by others when so noted.
    - a). The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

End of Section

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Section 01 12 00  
PROJECT PHASING REQUIREMENTS

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Requirements for phasing of Work include logistics, phasing, and completion of designated phases prior to commencement of subsequent phases.

1.3 RELATED SECTIONS

- A. Section 01 10 00: SUMMARY OF WORK
- B. Section 01 31 00: PROJECT MANAGEMENT AND COORDINATION
- C. Section 01 33 00: SUBMITTAL PROCEDURES
- D. Section 01 32 00: CONSTRUCTION PROGRESS DOCUMENTATION
- E. Section 01 50 00: TEMPORARY FACILITIES AND CONTROLS
- F. Section 01 77 00: CONTRACT CLOSEOUT

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

3.1 SUBMITTALS

- A. Contractor shall submit a Project site and building logistics plan in accordance with the requirements of this Section. Schedule issued herein is a guide as to the minimal requirements, the CM shall further investigate and coordinate all the required items, and include associated costs of their and subcontractors work, outline and coordinate the responsibilities and work of the School, Utility Companies, and other parties involved in the complete construction and occupancy as part of the schedule.

3.2 LOGISTICS

- A. Prior to commencement of Work, Contractor shall prepare and submit to Architect/OPM/DPW/WPS a detailed Project site/building logistic plan, in same size and scale of Drawings, setting forth Contractor plan of Work relative to following, but not limited to, items:
  - 1. Hauling route shall be in accordance with local ordinances and the DEP Administrative Consent Order, a truck access route to and from Project site.
  - 2. The identification of any overhead wire restrictions for power, streetlighting, signal or cable.
  - 3. Protection of sidewalk pedestrians and vehicular traffic.

4. Project site fencing and access gate locations.
  5. Construction parking.
  6. Material staging or delivery areas.
  7. Material storage areas.
  8. Temporary trailer and storage locations.
  9. Temporary service location and proposed routing of all temporary utilities.
  10. Location of temporary or accessible fire protection
  11. Trash removal and location of dumpsters.
  12. Concrete pumping locations.
  13. Crane locations.
  14. Location of portable sanitary facilities.
  15. Mixer truck wash out locations.
  16. Traffic control signage.
  17. Perimeter and site lighting.
  18. Storm Water Pollution Prevention Plan – SWPPP
  19. Stockpile, or lay down areas.
  20. Security lighting.
  21. Egress plans, egress and emergency lighting plans
  22. Temporary utility connection and lighting, security, plans for all trades
  23. Weather Protection.
- B. Revised Project site and building logistic plan will be required to be updated for each identified phases of Work as set forth in this Section.
- C. Contractor is responsible for securing and/or obtaining all approvals and permits from authorities having jurisdiction relative to any activities set forth in Section 3.2.A. Construction work
- D. All work shall be done in accordance with NFPA 241, including all reviews with the AHJ, and section 1.3.4 "A safety program shall be included in all construction, alteration, or demolition contracts."
- E. Refer to General Conditions for work sequencing of all trades, work adjacent to occupied areas must be scheduled as not to interfere with the school's operations, all disruptive work of all trades shall be scheduled second shift. The school's schedule is critical to meet, all trades shall include in their bid, working weekends, second shifts as required to maintain the published schedule.

### 3.3 PHASING OF THE WORK

- A. Project will be constructed in separate Phases coordinated with the school calendar as described in this Section and indicated on the Drawings. Phasing will also delineate Work to be completed in each designated phase. Unless otherwise approved or directed by Owner, each phase shall be completed according to approved Baseline Schedule prior to commencement of next subsequent phase. Contractor shall incorporate and coordinate Work of Separate Work Contracts relative to this Project into the Phasing and Construction Schedule, follows is issued as a guideline for the CM.

PHASE #1 -June 2018-August 2018

1. Enabling Site Work
2. Installation of Erosion Control
3. Construction of parking areas, retaining wall, access around the school, separation of the school site from the construction areas. Refer to enabling bid documents for specifics
4. Maintenance of areas within the construction fence
5. Installation and reconfiguration of temporary site fence prior to start of school year

PHASE #1A - August 2018-November 2018

1. Enabling Site Work
2. Completion of retaining wall, completion of temporary paving within project site fence
3. Contractor to maintain all separations and access to the school site and the primary site access road

PHASE 2- November 2018 – June 2021

1. Building Construction
2. Substantial completion of building no later than June 1, 2021.
3. All site utilities completed for new building tied in and operational
4. Building commissioning

PHASE 2A – June 2019 – August 2019

1. Installation of underground recharge system #1
2. Re-establish temporary parking over recharge system on existing school site and protect system on construction side
3. Install retaining wall and fence at existing building bus loop and make safe prior to start of school

PHASE 3A - June 2021 – August 2021

1. Disconnection of utilities at existing school and make safe
2. Abate and demolish school north of "Main Street"
3. Move the construction trailers and reconnect utilities
4. Install parking areas, roadways and walks at primary and secondary entrances
5. Final grading and paving
6. Landscaping
7. Relocate fill from onsite stockpiles and begin grading front of site
8. Maintain access to new school for owner occupancy and FF&E deliveries

PHASE 3B – June 2021 – July 2022

1. Complete abatement and demolition
2. Continue relocation of onsite stockpiles
3. Complete installation and connection of drainage systems
4. Begin final grading at athletic fields
5. Continue work on site retaining walls and other site improvements
6. Complete all remaining contract work
7. Final paving at remaining areas

8. Install remaining walks
9. Complete all landscaping and touch up work
10. Complete all site improvements

#### 3.4 PHASING OF THE WORK – GENERAL

- A. Owner will be impacted by not having all Work of each Phase completed within the indicated schedule and overall Project completed within the Contract Time. It is mandatory Work be complete within Phases and Contract Time.
- B. Site Contractor is responsible for snowplowing, maintaining access to all areas under their control. Landscaping Contractor is responsible for watering, maintenance, and mowing of all areas until accepted by the Owner. Owner is responsible for snowplowing, mowing and maintaining walkways, paths and fields under areas of their use and control.
- C. SUBCONTRACTORS RESPONSIBILITIES;  
Subcontractors to coordinate their work in accordance with the phasing plan of the CM, including the minimal items outlined in this and sub sections of the specifications and drawings. PHASING OF THE WORK
- D. General Requirements All Phases
  1. Egress and exit capacities must be established and maintained from all occupied areas, kept clearly labeled, including exit lights and emergency lights (installed, maintained and removed upon completion by the electrical contractor) during all occupied phases. Contractor to establish regular communications with representatives of the school, code department, Worcester Fire Department and Owner's representatives.
  2. Reference drawings and specification sections for areas and additional information and requirements.

#### 3.5 PHASING PLANS

Refer to the following Phasing Plans published here for reference. Refer to the electronic bid file for colored version at full size.

End of Section

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Section 01 14 00  
WORK RESTRICTIONS

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Use of Site.
- B. Access to Site.
- C. Work Sequencing.
- D. Workforce requirements.
- E. Hours for on-site operations and restrictions.
- F. Coordination with occupants.
- G. Worker Identification Badges
- H. Worker sex offender record information (SORI) Reporting and criminal offender record (CORI) reporting.
- I. Worker conduct, appearance and Work Rules.

1.2 RELATED REQUIREMENTS

- A. Document 00 73 00 – SUPPLEMENTARY INSTRUCTIONS TO BIDDERS: Additional project requirements and work restrictions.

1.3 USE OF SITE

- A. Use of, and access to, site will be subject to special requirements of the Owner, as directed.
  - 1. Prior to beginning the Work of this Contract, the Construction Manager shall meet with the Owner and the Architect to determine procedures regarding access and use of the site, locations and access to staging and storage areas, tree protection, temporary barriers and fencing, and any special site conditions or restrictions regarding the use of the site areas surrounding the construction.
  - 2. Use of Owner's receiving/shipping areas: Construction Manager is responsible to deliver and receive all materials and equipment. Construction Manager is not permitted to have supplies or equipment shipped directly to them in care of the Owner or Building Manager.
  - 3. Security: Owner access must be permitted at all times in all construction areas, for purposes of security.
- B. Confine operations to areas within Contract limits indicated on the Drawings. Portions of the site and building beyond areas in which construction operations are indicated are not to be disturbed.

1. Use of on-site areas outside of the contract limits for workers parking or storage of materials must be pre-arranged with Owner. Schedule deliveries to minimize requirements for storage of materials.
  2. There shall be no work or construction activity within the wetlands or the buffer areas refer to Document 00 31 26 - INFORMATION AVAILABLE TO BIDDERS WORCESTER CONSERVATION COMMISSION ORDER OF CONDITIONS and attachments.
- C. Keep all public roads and walks, and access drive to facility clear of debris caused by this Work during building operations.

#### 1.4 ACCESS TO SITE

- A. The Owner intends to occupy parking areas and access roads during construction. Notify the Owner of work which will affect the use of these areas; coordinate work schedule with Owner. The Construction Manager shall consult with the Owner on the best ways to provide access and on changes to access areas as the work progresses.
- B. Keep all public roads and walks, and access drive to facility clear of debris caused by this Work during building operations.

#### 1.5 COORDINATION WITH OCCUPANTS

- A. General: Perform all work in such a manner as to prevent interference with the Owner's operation of the facility, nor endanger the health, safety and well being of the facility's staff and students.
1. Take all measures to insure the safety of students, staff and the general public. The Construction Manager must take every reasonable precaution and employ all necessary measures including extra cleaning, special supervisory personnel, and additional temporary barriers and signage to facilitate the clean, quiet, safe, and continual operation of the facility.
  2. The work will be done in an occupied building active site accessible to the public. It is imperative that the Construction Manager, its subcontractors and all their personnel treat the staff and students with consideration and respect. No unnecessary noise or disruption of the academic or social activities of the school will be permitted.
- B. Interruption of services: Any major work entailing disruption to heating, lighting, life safety system utility connections or other similar major disruption to building functioning must be coordinated with the Owner, and temporary services, safety precautions, or connections provided. Do not shut down any service without approval of the Owner.
1. Provide both Owner and Architect with 72 hour (3 work days minimum) notification for any disruption of service; provide notification for connecting, disconnecting, turning on or turning off any service which may affect Owner's operations.
  2. Provide 48 hour (2 work days minimum) notice to local fire department of disruptions in electrical services, fire alarm services and emergency power services.
  3. Any action either planned or unplanned, by the Construction Manager which impairs the operation of anyone or the activation of the fire alarm detection



and or suppression system shall cause notification of the appropriate party. In case of unplanned, accidental, impairment, the Construction Manager will immediately notify the Owner. The Construction Manager should be prepared to provide assistance as required to correct the problem.

#### 1.6 WORK FORCE REQUIREMENTS

- A. The Construction Manager acknowledges the stringent requirements of the Owner with respect to the dates of Substantial Completion for various Portions of the Work, and recognizes that the construction schedule may require that work proceed on an accelerated basis. The Construction Manager further acknowledges that requirements related to items such as safety, service to Owner occupied areas, or Construction Manager access to Owner occupied areas may mandate that some operations be performed only after "normal school hours" or other occupancy hours. The Construction Manager therefore agrees that the Work of his own forces and of his subcontractors, including all Trade Contractors, shall be performed on an overtime and/or double-shift basis if and to the extent necessary in order that the construction schedule be met.
- B. Neither overtime nor double-shift work shall be grounds for any claims for compensation to the Construction Manager or to any Trade Contractor or subcontractor. If the nature of overtime or double-shift work requires that the Owner provide personnel to operate the facility at times when they would not normally be present, such personnel costs shall be borne or reimbursed by the Construction Manager.
- C. Restricted access hours (Closed Gate Period): Access to the school and site is prohibited during school bus drop off and pick-up hours. No construction deliveries, vehicular traffic, or hauling away may occur at the site during School bus drop-off and pick-up times which are 7:00 AM to 7:30 AM, and 1:30 PM to 2:30 PM. The Construction Manager shall coordinate with the Owner Project Manager and Awarding Authority to determine exact times and durations for restricted access hours.
  - 1. All gates to Construction site shall be closed during the above specified time periods.
  - 2. No vehicles (except fire, police and rescue) may enter or exit the construction site during the above time periods.
  - 3. Any vehicle which arrives at the school during the "Closed Gate" time must move to a location acceptable to the Owner. No vehicles will be allowed to idle on the project site, or any other nearby street. The Construction Manager shall be responsible for enforcing this requirement.
- D. School vacation dates: School vacation schedule is listed under Information Available for Bidders. The Construction Manager is required to coordinate with the Owner's Project Manager prior to scheduling Work during vacation dates.
- E. Winter Conditions: The Owner and Construction Manager recognize that time is of the essence for completion of this Contract and agree to continue work throughout the winter months without delay.
- F. Municipal Authority: The Construction Manager shall comply with all local ordinances, including those with respect to work start, finish, and weekend work.

- G. None of the requirements herein shall be construed as relieving the Construction Manager of his responsibility to conduct his operations in conformance with local ordinances or requirements established by authorities having jurisdiction.

#### 1.7 HOURS FOR ON-SITE OPERATIONS AND RESTRICTIONS

- A. Hours of operation and restrictions:
  - 1. Hours of construction, 7:00 AM to 5:00 PM local time, Monday to Friday. Provisions for working hours other than those specified, must be pre-arranged with the Owner.

#### 1.8 WORKER CRIMINAL OFFENDER RECORD (CORI) REPORTING

- A. Sex Offender Record Information (SORI) Reporting and Criminal Offender Record Information (CORI) Reporting. In accordance with MGL c6 §178 and c71 §38R respectively, the School Superintendent or School Principal will require sex offender record information ("SORI") and criminal offender record information ("CORI") from the criminal history systems board, relating to any worker who is scheduled to work on any portions of the school property. The Construction Manager, Trade Contractors and subcontractors shall make every effort to provide the Owner's Project Manager with a list of the proper paperwork at least two weeks before any workmen who they anticipate will be on site. All approved workers on the project shall wear visible I.D. badges at all times. The Construction Manager shall be responsible for issuing these badges and enforcing this requirement. Workers failing to display their I.D. badges will be removed from the site. The Owner reserves the right to stop work if there has been a failure to comply with this paragraph, in which event the Construction Manager, Trade Contractors and subcontractors shall have no claim for damages, delay or time extensions against the Owner.
  - 1. Refer to the Worcester Public Schools CORI Request Form included at the end of this Section. Coordinate reporting requirements with Document 00 73 00 - Supplementary Instructions to Bidders

#### 1.9 WORKER IDENTIFICATION BADGES

- A. Provide an identification badge (ID card) to each worker, materials supplier and vendor authorized to enter premises.
  - 1. All personnel on site shall visibly wear an identification badge issued by the Construction Manager.
    - a. All construction personnel on-site shall be issued and wear a identification badge.
    - b. Delivery and Vendor Personnel who are on site only for deliveries shall be issued a temporary visitor's ID card which shall be returned to the Construction Manager when leaving the site.
    - c. Authorized Visitors who are on site for meetings, inspections and similar activities, shall be issued a temporary visitor's ID card which shall be returned to the Construction Manager when leaving the site.
  - 2. Identification badges and visitor badges shall be in format, color and size approved by Owner.
  - 3. Personnel identification badges to include: Personal photograph, name and assigned number, expiration date, and employer.

4. Return of identification badges:
    - a. Require return of personnel identification badges at expiration of employee contribution to the Work.
    - b. Temporary ID cards shall be issued and returned on a daily basis.
  5. All construction personnel are required to wear their issued identification badge at all times when on school grounds.
- B. Maintain a list of accredited persons having identification cards, submit copy directly to Owner upon request.
1. Include in list, employee name, assigned number, date of issue, expiration date, and employer.

#### 1.10 WORKER CONDUCT, APPEARANCE AND WORK RULES

- A. General Conduct and Demeanor: All construction workers shall treat all other workers, Owner staff, student and the public with respect and courtesy.
1. The conduct and appearance of each worker at the job site is of paramount importance. The Owner reserves the right to require any worker to be banished from the Site.
- B. Privacy: Conduct all work of the Contract with the maximum effort to maintain the privacy of the Owner's operations, staff, and students. Do not permit the workers to peer into other areas of the building visible from the work area. Invasion of privacy is a major infraction of the work rules.
- C. Physical Appearance: Require each worker to dress appropriately in a clean, neat, and professional manner.
1. Sleeved shirts and long pants are required minimum clothing. Short sleeved shirts may not be rolled up. Shirts may not be rolled up at the waist. Pants may not be rolled up past the top of the boots or shoes worn. Anyone not in compliance is subject to immediate dismissal.
- D. Entertainment Devices (including, but not limited to radios, CD players, MP3 players and televisions): The use of all entertainment devices, including portable listening devices (ipod™ type) with headphones or earphones, is strictly prohibited at all times.
1. Construction Manager shall control the volume of all communication radios and loudspeakers to avoid creating a nuisance.
- E. Medications and Drugs: Do not allow any drugs or mood-altering substances, except for qualified, legal prescriptions; when requested, allow inspection of prescription drugs.
- F. Smoking: Smoking is strictly prohibited on school property.
- G. Language: Foul and rude language is strictly prohibited.
- H. Physical Actions: Running, horseplay, fighting, and other unprofessional conduct is prohibited. Fighting is a major infraction of the work rules.

- I. Stealing: Stealing of any materials, objects, furnishings, equipment, fixtures, supplies, clothing, or other items will not be tolerated and is a major infraction of the work rules.
- J. Sexual Harassment: All forms of physical and verbal sexual harassment will not be tolerated and is a major infraction of the work rules. Sexual harassment includes, without limitation: touching, whistling, sexually explicit stories, jokes, drawings, photos and similar representations, exhibitionism and all other sexually oriented offensive behavior.
- K. Warnings and Dismissal:
  - 1. For minor infractions of the rules, the Owner may issue a warning. Only one warning will be allowed per worker. A second infraction will result in immediate dismissal of the worker from the Site.
  - 2. For major infractions of the rules, the worker shall be dismissed immediately without warning and is subject to possible criminal prosecution.
- L. Notification of Workers: Clearly notify and educate each worker about these Work Rules and the requirements for worker conduct and appearance.
  - 1. Recommendation: The Owner recommends that the Construction Manager notify each worker of the work rules in writing and obtain a signed acknowledgment of the worker's understanding of the work rules as a condition of employment on this project.

#### 1.11 PROJECT PHASING

- A. Refer to Document 01 12 00 – PROJECT PHASING REQUIREMENTS and Document 07 30 00 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS.

#### **PART 2 - PRODUCTS** (Not Used)

#### **PART 3 - EXECUTION** (Not Used)

End of Section

## **SECTION 011500**

### **CONTROL OF SITE, WORK AND MATERIALS**

#### **PART 1 GENERAL**

##### **1.1 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

##### **1.2 SUMMARY**

- A. This section is intended to provide information on topics which are not necessarily mentioned elsewhere in the Contract Documents as follows:

1. Hauling, Handling and Storage of Materials
2. Open Excavations
3. Care and Protection of Property
4. Protection and Relocation of Existing Structures and Utilities
5. Discovery.
6. Sanitary Regulations
7. Safety and Health Regulations
8. Site Investigation
9. Hazardous Waste
10. Borings and Subsurface Data and Geotechnical Data.
11. Existing conditions plan/topographical survey.
12. Permits.
13. Work sequence scheduling and coordination.
14. Work hours.
15. Work conditions.
16. Contractor's Project Team.
17. Owner's Project Manager's Representative
18. Contractor's use of premises.
19. Noise, dust, and pollution control.
20. Maintenance of traffic.
21. Contractor's use of city streets.
22. Noise, dust and pollution control.
23. City of Worcester ordinance, licenses, permits and fees.
24. Rejected materials and defective work.

- B. Related Requirements:

Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to the following:

1. Document GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS.
2. Section 01500, Construction Facilities and Temporary Controls.
3. Section 01569, Tree and Plant Protection.
4. Section 01571, Erosion and Sediment Control.

### **1.3 HAULING, HANDLING AND STORAGE OF MATERIALS**

- A. The Contractor shall, at his own expense, handle and haul all materials furnished by him and shall remove any of his surplus materials at the completion of the work.
- B. The Contractor shall provide suitable and adequate storage for equipment and materials furnished by him that are liable to injury and shall be responsible for any loss of or damage to any equipment or materials by theft, breakage, or otherwise.
- C. All excavated materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such location as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.
- D. The Contractor shall be responsible for all damages to the work under construction during its progress and until final completion and acceptance even though partial payments have been made under the Contract.

### **1.4 OPEN EXCAVATIONS**

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The Contractor shall, at his own expense, provide suitable and safe means for completely covering all open excavations and for accommodating travel when work is not in progress.
- B. The length of open trench will be controlled by the particular surrounding conditions but shall always be confined to the limits length that can be backfilled by the end of each work day.
- C. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, then special construction procedures shall be taken, such as limiting the length of trench and prohibiting stocking excavated material in any neighborhood street.

- D. All street excavations shall be completely closed at the end of each work day. Backfilling or use of steel plates of adequate strength to carry traffic shall be used.

## **1.5 CARE AND PROTECTION OF PROPERTY**

- A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be promptly restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, to the satisfaction of the Owner.
- B. Work Limits with Restrictions:
  - 1. The Plans clearly define areas of the site that are subject to work restrictions.

## **1.6 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES**

- A. All existing buildings, utilities, pipes, poles, wires fences, curbs, property line markers and other structures which the Architect decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the contractor. Should such property be damaged, it shall be restored by the Contractor, at no additional cost to the Owner.
- B. The Contractor shall determine the location of all underground structures and utilities (including existing water services, drain lines, electrical lines, and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by Contractor.
- C. On paved surfaces the Contractor shall not use or operate tractors, bulldozers, or other power-operated equipment with treads or wheels which are shaped so as to cut or otherwise damage such surfaces.
- D. All property damaged by the Contractor's operations shall be restored to a condition at least equal to that in which it was found immediately before work was begun and to the satisfaction of the Owner. Suitable materials and methods shall be used for such restoration.
- E. Restoration of existing property and structures shall be carried out as promptly as practicable and shall not be left until the end of the construction period.

## **1.7 DISCOVERY**

If during the demolition, excavation, disposal, or other work, articles of unusual value, or of historical or archaeological significance are encountered, the ownership of such articles is retained by the Owner and information regarding their discovery shall be immediately furnished to the Architect. If the nature of the article is such that the work cannot proceed without danger of damaging same, work in that area shall be immediately discontinued until the Architect through the Owner's Project Manager, has decided the proper procedure to be followed. Any time lost thereby shall be condition for which the time of the Contract may be extended. All costs incurred after discovery in the salvaging of such articles shall be borne by the Owner.

## **1.8 SANITARY REGULATIONS**

- A. Sanitary conveniences for the use of all persons employed on the work, properly screened from public observation, shall be provided in sufficient numbers in such manner and at such locations as may be approved. The contents shall be removed and disposed of in a satisfactory manner as the occasion requires. The Contractor shall rigorously prohibit the committance of nuisances within, on or about the work. Any employees found violating these provisions shall be discharged and not again employed on the work without the written consent of the Architect. The sanitary conveniences specified above shall be the obligation and responsibility of the Contractor.

## **1.9 SAFETY AND HEALTH REGULATIONS**

- A. This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations (454 CMR 10.0 et. seq.)." Contractors shall be familiar with the requirements of these regulations.

## **1.10 SITE INVESTIGATION**

- A. The Contractor acknowledges that he has satisfied himself as to the conditions existing at the site of the work, the type of equipment required to perform this work, the quality and quantity of the materials furnished insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the drawings and specifications made a part of this contract. Any failure of the Contractor to acquaint himself with available information will not relieve him from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner or Architect and Sub-Consultants assumes no responsibility for any conclusion or interpretation made by the Contractor on the basis of the information made available by the Owner.

## **1.11 HAZARDOUS WASTE**



- A. Should the Contractor, while performing work under this contract, uncover hazardous materials, as defined in Massachusetts Hazardous Waste Regulations 310 CMR 30.00, he shall immediately notify the Architect. The Contractor is not, and has no authority to act as, a handler, generator, operator or disposer of hazardous or toxic substances found or identified at the site, and the Owner shall undertake all such functions.

#### **1.12 BORINGS, SUBSURFACE DATA AND GEOTECHNICAL DATA**

- A. The site has been extensively modified by a site preparation contract which included rock excavation and filling to new subgrade under the control of the Geotechnical Engineer.
- B. Survey, as built information and grade will be provided by the Civil Engineer and Geotechnical Engineer at completion of the Site Preparation Work.

#### **1.15 WORK SEQUENCE SCHEDULING AND COORDINATION**

- A. The Work shall be sequenced, scheduled, and coordinated to achieve the Date of Substantial Completion.
  - 1. Delivery and placement of new kitchen equipment for final connection to utilities under this contract.
- A. The Contractor and each Sub-Contractor shall establish and increase or decrease as appropriate the workforce, days of work, number of shifts, work hours, materials, tools and equipment needed to maintain and achieve the Date of Substantial Completion.
- B. The Contractor and each Sub-Contractor shall increase the workforce, days of work, number of shifts, work hours, materials, tools, and equipment needed to maintain the Date of Substantial Completion as necessary to accommodate any additional work authorized by Construction Change Directives and Change Orders modifications.
- C. The Contractor will be responsible for the proper conduct of the work to ensure that all trades work together, and in harmony, to achieve substantial and final completion as specified.

#### **1.16 WORK HOURS**

- A. Normal working hours are to be Monday thru Friday from 7:00 AM to 3:30 PM, except Legal Holidays. Any working hours outside of these times shall be considered "Extended Hours" and treated as described below. No equipment may be idled or have engines running prior to 7:00 AM.

- B. Extended work hours shall require prior scheduling and coordination with the Architect and Owner at a minimum of 48-hours in advance. Extended work hours on Sundays and Legal Holidays may also require a permit from the Police Department.
  - 1. Upon permission from the Architect and Owner, and prior to the start of any extended work, pay for all fees and obtain through the City of Worcester Police Department a work permit for all Sundays and Legal Holidays.

#### **1.17 WORK CONDITIONS**

- A. Neither the Contractor, nor Sub-Contractors at any level, nor their employees shall bring illegal substances or alcoholic beverages on the premises.
- B. Vulgar, abusive, obscene language or behavior will not be tolerated.
- C. Contractor's personnel engaging in the above shall be removed from the job-site.
- D. This building is smoke-free; therefore smoking is prohibited within the building

#### **1.18 CONTRACTOR'S PROJECT TEAM**

- A. The Contractor shall provide a full time Project Manager qualified for a project of this size and complexity, and having the skills necessary for working with people. Project Manager shall primarily be on site.
- B. The Contractor shall provide a qualified General Superintendent, who shall be present, full time, on site daily during all work in progress until the Date of Substantial Completion, and for such additional time thereafter as the Architect may determine. Only under extenuating circumstances, with the approval of the Architect and Owner, will the contractor be allowed to substitute for the General Superintendent prior to the date of Final Completion.
  - 1. The General Superintendent shall supervise and direct the activities of other superintendents and foremen on the site. He shall not perform the work of foremen, tradesmen, or home office staff.
- C. The Contractor shall employ a full time Scheduler.
  - 1. Refer to Section 01325, Project Progress Schedules, for specifics and Part 1.06 of same section for additional information.
- D. The Contractor shall employ a full time MEP and equipment coordinator.
  - 1. Refer to Section 01040, Project Coordination, for specifics.

- E. Each Filed Sub-bidder and each subcontractor shall provide a Lead Foreman, responsible to be on site full time during the workday.
  - 1. Each foreman, in addition to his regular duties shall be responsible for establishing, maintaining, and providing record drawings, which required to be updated prior to submitting the current periods draft Application for Payment.

The above personnel shall not be discharged or changed without prior written consent of the Architect, which will not be unreasonably withheld. The Contractor shall submit credentials of the Contractor's project team to the Owner's Project Manager for their approval.

#### **1.19 OWNER'S PROJECT MANAGERS REPRESENTATIVES**

- A. Reference within the Contract Documents to terms Owner's Representative and Owner's Project Manager shall mean the Owner's Project Manager, CBRE/Heery International.
  - 1. Reference within the Contract Documents to terms Owner's Representative and
    - 2. Cooperate: Fully and completely cooperate with the Owner's Project Managers.
    - 3. Personnel and Staffing Information: Provide the Owner's Project Manager with information on personnel currently working on the project. Identify for the Owner's Project Manager all persons at the site, both workers and visitors.
    - 4. Work Planned: At least every Monday morning, inform the Owner's Project Manager about the work expected to be done during the week.
    - 5. Unusual Conditions and Occurrences: Immediately notify the Owner's Project Manager about all unusual conditions and occurrences at the site.
- C. Owner's Observation of Construction Means, Methods, and Techniques: Means, methods, and techniques used in the work are the sole responsibility of the Contractor. If the Owner's Representatives determine that the means, methods, techniques, and materials used results in work which does not conform to the Contract Documents, the Owner's Representatives may notify the Contractor. The Contractor shall maintain an accurate and up-to-date log of all such notifications from the Owner's Representatives, and shall record the response action taken and the date and time when the Architect was consulted for additional clarification or direction. If the Contractor does not acknowledge or resolve the question, the Owner's Representatives will notify the Owner and Architect.
- D. Provide Field Offices for the Owner's Project Manager in accordance with Section "Temporary Facilities".
- E. Radio Communication: At all times work is in progress, provide and maintain at least two portable, lightweight, two-way radios with belt holsters for the sole use of the

Owner's Representatives. The radios shall be capable of using all the frequencies used by the Contractor's other on-site radios. Provide two desk-top battery chargers and at least two spare batteries.

Non-Standard Work House: Provide at least 5 day written prior notice to the Owner's Representatives for all work done during non-standard work hours such as overtime, weekends, and holidays, information be updated and current prior to granting consent.

## **1.20 CITY OF WORCESTER, ON-SITE PERSONNEL**

- A. The City of Worcester or the Owner's Project Manager may provide one or more on-site architects to expedite the work.
- B. The City of Worcester or the Owner's Project Manager may provide one or more on-site Clerk of Works to monitor and observe the work in conjunction with A, above.
- C. Provide field offices in accordance with Section "Temporary Facilities".
- D. Radio Communication: from "E" above.

## **1.21 CONTRACTOR USE OF THE PREMISES**

- A. After the Contractor's acceptance of the Phase 1 work the contractor shall have complete and exclusive use of the premises from date of contract to the date of substantial completion for execution of the Work within the Limits of Work indicated and shall coordinate use of the site with other contractors performing work for the Owner. Contractor's use of premises is limited only by the Owner's right to perform work with his own forces.
- B. Prior to beginning work of the Contract, the Contractor shall meet with the Owner's Project Manager and the Architect to determine procedures regarding access to and use of site, exterior staging, parking, and storage areas, tree protection, special site conditions, and any other restrictions regarding the use of the site areas surrounding the construction.
  - 1. Coordinate use of premises under direction of the Awarding Authority and the Owner's Project Manager.
  - 2. Assume full responsibility for the protection and safekeeping of Products under this Contract, stored on the site.
  - 3. Obtain and pay for the use of additional storage or work areas needed for operations.
  - 4. Move any stored Products, under Contractor's control, which interfere with operations of the Owner's Project Manager, Owner or separate contractor.

- C. Where work on public roads or walks, or other work on municipal property or easements is done, all such work shall conform to applicable portions of this Specification and the rules, regulations, and specifications of the public agencies having jurisdiction. Wherever work on a public street is done, a City of Worcester special duty police officer must be present unless changes in statutes and ordinances permit the use of flagmen. All permits and fees in relation to such off-site work shall be obtained and paid for by the General Contractor.
- D. The Contractor shall keep all public and private access roads and walks clear of debris caused by this work during the entire term of the Contract. He shall repair all public and private streets, drives, curbs, walks, and other improvements where disturbed by work of, or related to, building operations, leaving them in as good condition after completion of the work as before operations started, in accordance with rules, regulations, and specifications of the public agencies having jurisdiction. Repairs shall be made within 10 days of Completion of Work.
- E. Parking for workmen's personal vehicles shall be permitted only within the Contract Limit Lines on the Drawings. Parking on adjacent streets is not permitted.
- F. Access roads and fire-lanes on and about the site shall be kept open and free at all times, including public streets and access to private homes and roads.

## **1.22 MAINTENANCE OF TRAFFIC**

- A. Unless permission to close the street is received in writing from the proper City of Worcester authority, all construction work shall be conducted so that the existing pre-construction patterns of vehicular and pedestrian traffic may be maintained at all times.
- B. Should the Chief of Police deem it necessary, uniformed officers will be assigned to direct traffic. The Contractor shall make all arrangements in obtaining uniformed officers required.
- C. The Contractor shall at his own expense, as directed by the Police Traffic Control/Safety Officer, provide and erect acceptable barricades, barrier fences, traffic signs, and all other traffic devices not specifically covered in a bid item, to protect the work from traffic, pedestrians, and animals. He shall provide sufficient temporary lighting such as lanterns/flashers (electric battery operated) or other approved illuminated traffic signs and devices to afford adequate protection to the traveling public, at no additional cost to the Owner.
- D. The Contractor shall furnish all construction signs that are deemed necessary by and in accordance with Part VI of the Manual on Uniform Traffic Control Devices as published by the U.S. Department of Transportation. In addition, the Contractor may be required to furnish all special construction warning signs. Size and exact wording of signs shall be determined by the Owner's Project Manager during construction.

- E. The intent of policing is to insure public safety by direction of traffic. Police officers are not to serve as watchmen to protect the Contractor's equipment and materials.
- F. Nothing contained herein shall be construed as relieving the Contractor of any of his responsibilities for protection of persons and property under the terms of the Contract.

### **1.23 CONTRACTOR USE OF CITY STREETS**

- A. Contractor's personnel, and all other personnel employed on the project, shall park on the site only at the area designated for construction and as permitted by the Contractor. Contractors personnel may not park on city streets. Parking on street sidewalks is prohibited.
- B. Deliveries, Access, Parking or use of existing school driveway is strictly prohibited except for utility work and other work indicated along driveway. Contractor shall enforce this restriction as required and with the use of signage at the entrance of driveway and communication to all employees, Vendors, Suppliers, filed and non filed subcontractors etc.
- C. Driveway entrances, walks, and yards to abutting properties shall be kept unobstructed at all times.
- D. Off road vehicles can be used within the project limit lines.

### **1.24 NOISE, DUST, AND POLLUTION CONTROL**

- A. All work performed under the Contract shall conform to the requirements of Chapter III, Section 31C and Section 142D of the General Laws, Commonwealth of Massachusetts and Rules and Regulations adopted thereto by the Commonwealth of Massachusetts, Department of Public Health, and the requirements of local noise, dust, and pollution control laws, ordinances, and regulative agencies applicable to the work.
- B. The Contractor shall endeavor at all times to maintain as low a level of construction noise as practicable in order not to create a disturbance in the neighborhood or the adjacent residential premises.
- C. Noise control measures shall include as a minimum but not limited to
  1. Use of maintained properly muffled equipment.
  2. Provide muffled enclosures for all noise producing equipment.
  3. Use the least noisy construction techniques practical.
  4. Use of electric powered tools and equipment in lieu of air powered, engine powered, or generator powered tools and equipment.

5. Schedule noise producing activities to the shortest extent possible. No noise producing activities are allowed prior to 7:00AM including engines idling or running.
  6. Turn off all unneeded and idling equipment and engines.
  7. No radios or CD players or the like are allowed outside.
  8. Locate noise sources as far as possible from noise sensitive locations
- D. Any complaints duly registered by the Owner of unacceptable noise levels shall be cause for the use of special precautions and methods of operation by the Contractor to reduce noise to acceptable levels, at no additional cost to the Owner.
- E. The Owner's Project Manager shall be the sole judge of the tolerableness of noise levels.
- F. "Wheel Wash", Contractor shall provide all facilities for preventing spread of objectionable matter outside of the site areas through washing of vehicles and vehicle wheels, decontamination of vehicles transporting hazardous waste containing materials and all other means necessary.
- G. Dust Control; During the progress of the work, the Contractor will conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Engineer decides it is necessary to use calcium chloride for more effective dust control, the Contractor will furnish and spread the material, as directed. Calcium Chloride will not be used for dust control within a drainage basin or in the vicinity of any source of potable water
- H. Any water that is pumped and discharged from the trench and/or excavation as part of the Contractor's water handling will be filtered by an approved method prior to its discharge into a receiving water or drainage system
- I. Under no circumstances will the Contractor discharge water to the areas designated as wetlands. When constructing in a wetlands area, the Contractor will discharge water from dewatering operations directly to the nearest drainage system, stream, or waterway after filtering by an approved method.
- J. The pumped water will be filtered through baled hay, a vegetative filter strip or a vegetated channel to trap sediment occurring as a result of the construction operations. The vegetated channel will be constructed such that the discharge flow rate will not exceed a velocity of more than 1 foot per second. Accumulated sediment will be cleared from the channel periodically.

#### **1.25 CITY OF WORCESTER ORDINANCES, LICENSES, PERMITS, AND FEES**

- A. All Contractors shall comply with City Ordinances which may affect the work of this contract and which have not been previously covered in the Contract Documents.

Requirements and fees listed are those in effect as of this writing and each Contractor shall be responsible for verifying the requirements and fee cost as currently in effect and throughout the duration of this project. This includes, but is not limited to, the following:

1. Worcester Police Department.
  - a. Police Details
    - 1) Hourly rate for ½ day or full day
  - b. Permits for Sunday and Holiday Work
    - 1) Fee Required
2. Department of Public Works, Permits Division
  - a. Street Opening Permit Bond
    - 1) \$ 5,000.00
  - b. Barricade Placement by DPW
    - 1) 1st \$90 per day
    - 2) Each additional \$ 55 per day
  - c. Drain layers License
    - 1) New \$ 140.00
    - 2) Annual Renewal \$ 60.00
  - d. Drain Permit
    - 1) \$ 95.00
  - e. Sanitary Connection (Gallorage Fee)
    - 1) To be paid for by the City
  - f. Main Inspection
    - 1) \$ 1.71 per Foot
  - g. Assessment
    - 1) To paid for by the City
  - h. Permit Manuals
    - 1) \$ 5.00
  - i. Plan Review
    - 1) \$ 60.00
  - j. Street Obstruction
    - 1) \$ 87.00 each



- k. Street Obstruction (Blanket Permit)
  - 1) \$ 1,000.00 per year
- l. Street Opening
  - 1) Pavement older than 5 years \$ 87.00
  - 2) Pavement 5 years old or less \$ 174.00
- m. Water meter, etc. Contact Water Department at 508-799-1492.
- n. Traffic & Parking. Contact Department at 508-799-1468.
- 3. Worcester Fire Department
  - a. Fire and Smoke Alarm
  - b. Automatic Sprinkler and Standpipes
  - c. Contact Worcester Fire Department at 508-799-1826.
- 4. Department of Code Enforcement
  - a. Building Permit
    - 1) Based on total contract price
      - a) To be paid for by the City
    - 2) Document Microfilm
      - a) To be paid for by the City
    - 3) Orders of Building Official under Chapter 1, 780 CMR.
    - 4) Ticket violation under Chapter 33, 780 CMR.
  - b. Trash Control
    - 1) Ticket for Violations
  - c. Environmental Control
    - 1) Air, Water, Noise Pollution - Ticket for Violations
    - 2) Conservation Commission Enforcement Officer
- B. The Contractor must determine and pay for any and all State or federal permit fees associated with the work required in this contract.

## **1.26 REJECTED MATERIALS AND DEFECTIVE WORK**

- A. Materials furnished by the Contractor and condemned by the Architect as unsuitable or not in conformity with the specifications shall forthwith be removed from the work by the Contractor, and shall not be made use of elsewhere in the work.

- B. Any errors, defects or omissions in the execution of the work or in the materials furnished by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the work, discovered at any time before the final payment is made hereunder, shall be forthwith rectified and made good by and at the expense of the Contractor and in a manner satisfactory to the Architect.
- C. The Contractor shall reimburse the Owner for any expense, losses or damages incurred in consequence of any defect, error, omission or act of the Contractor or his employees, as determined by the Architect, occurring previous to the final payment.

**PART 2 - PRODUCTS (Not**

**Used) PART 3 - EXECUTION**

**(Not Used)**

**END OF  
SECTION**

## SECTION 012500

### PRODUCT SUBSTITUTIONS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, are hereby made part of this Section.

##### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract.
- B. References Standards and Definitions: Refer to Section 01095 "Reference Standards and Definitions" for applicability of industry standards to products specified.
  - 1. Requirements for submitting the Contractor's Construction Schedule and the Submittal Schedule are included under Section 01300 "Submittals".
  - 2. Procedural requirements governing the Contractor's selection of products and product options are included under Section 01600 "Materials and Equipment".

##### 1.3 DEFINITIONS

- A. Definitions used in this Article do not change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:
  - 1. Specified options of products and construction methods included in the Contract Documents.
  - 2. The Contractor's determination of, and compliance with, governing regulations and orders issued by governing authorities.

##### 1.4 SUBMITTALS

- A. Substitution Request Submittal: Requests for substitution will be considered if received within two (2) days after commencement of the Work. Requests

received more than two (2) days after commencement of the Work may be considered or rejected at the discretion of the Architect.

1. Submit three (3) copies of each request for substitution for consideration. Submit requests in the form and according to procedures required for Change-Order Proposals.
2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.
3. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
  - a. Product Data, including Drawings and descriptions of products and fabrication and installation procedures.
  - b. Samples, where applicable or requested.
  - c. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
  - d. Cost information, including a proposal of the net change, if any in the Contract Sum.
  - e. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.
4. Architect's Action: Within five (5) days of receipt of a request for substitution the Architect will request additional information or documentation for evaluation necessary for the evaluation of the request. Within five (5) days of receipt of the request, or of receipt of additional information or documentation, whichever is later, the Architect will notify the Contractor of acceptance or rejection of the substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance will be in the form of a Change Order when a change in the Contract Sum or Contract Time is required; or in the form of the Architect's Supplementary Instructions when no change to the Contract Sum or Time is required.

## 1.5 WORK CONDITIONS / SEQUENCE

- A. If sub-contractors find that conditions are not appropriate for them to begin the work of their trade or if they are directed to perform their work out of sequence by the General Contractor or if the General Contractor directs sub- contractors to start and continue regardless of job conditions, the sub- contractor shall so notify the Architect in writing by certified mail immediately.

## PART 2 - PRODUCTS

### 2.1 SUBSTITUTIONS

- A. The Contractor's submittal and the Architect's acceptance of Shop Drawings, Product Data, or Samples that relate to construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.
- B. Conditions: The Architect will receive and consider the Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by the Architect. If the following conditions are not satisfied, the Architect will return the requests without action except to record non-compliance with these requirements.
1. Extensive revisions to the Contract Documents are not required.
  2. Proposed changes are in keeping with the general intent of the Contract Documents.
  3. The request is timely, fully documented, and properly submitted.
  4. The request is directly related to an "or-equal" clause or similar language in the Contract Documents.
  5. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
  6. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.
  7. The specified product or method of construction cannot be coordinated with other materials and where the Contractor certifies that the proposed substitution can be coordinated.
  8. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.

## PART 3 - EXECUTION (Not Used)

**DO NOT REMOVE  
THIS PAGE INTENTIONALLY LEFT BLANK**

## **SECTION 012600 - CONTRACT MODIFICATION PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
  - 1. Division 01 Section "Allowances" for procedural requirements for handling and processing allowances.
  - 2. Division 01 Section "Unit Prices" for administrative requirements for using unit prices.
  - 3. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

#### **1.3 MINOR CHANGES IN THE WORK**

- A. Architect will issue Supplemental Instructions (SI) authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time. See form of Supplemental Instructions at the end of this section.

#### **1.4 PROPOSAL REQUESTS**

- A. Owner-Initiated Request for Proposal (RFP): Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications. See form of Request for Proposal at the end of this section
  - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
  - 2. Within 20 days after receipt of Proposal Request, submit a Proposed Change Order (PCO) showing the proposed cost adjustments to the Contract Sum and the Contract Time necessary to execute the change. See form Proposed Change Order at the end of this section.

- a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  - c. Include costs of labor and supervision directly attributable to the change.
  - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a Proposed Change Order (PCO) to Architect.
  1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  4. Include costs of labor and supervision directly attributable to the change.
  5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
  6. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

## **1.5 CHANGE ORDER PROCEDURES**

- A. On Owner's approval of a Proposed Change Order (PCO), Architect will issue a Change Order (CO) for signatures of Owner and Contractor. See form of Change Order (CO) at the end of this section

## **1.6 CONSTRUCTION CHANGE DIRECTIVE**

- A. Construction Change Directive (CCD): Architect may issue a Construction Change Directive (CCD) on owner's form of Construction Change Directive (CCD). Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.



1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

## **PART 2 - PRODUCTS (Not Used)**

**EXECUTION – Examples of forms follow this page:** ACTUAL FORMS WILL REFLECT SOUTH HIGH COMMUNITY SCHOOL

1. Supplemental Instruction (SI)
2. Request for proposal (RFP)
3. Proposed Change Order (PCO)
4. Change Order (CO)
5. Construction Change Directive (CCD)





## SUPPLEMENTAL INSTRUCTIONS

CITY OF WORCESTER, MASSACHUSETTS

S.I. NUMBER:

000

S.I. DATE:

Date

---

**FOR THE PROJECT:**

DCU Center  
Refurbishment and Expansion  
50 Foster Street  
Worcester, MA 01608

**TO THE CONTRACTOR:**

Contractors Name  
Contractor Address

---

THE WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH THE FOLLOWING  
SUPPLEMENTAL INSTRUCTIONS FOR A MINOR CHANGE TO THE WORK WITHOUT  
CHANGE TO THE CONTRACT SUM OR CONTRACT TIME.

---

**DESCRIPTION:**

Enter Description of Work Here

**ATTACHMENTS:**      List Attachments Here

**CC:**

**Issued By:**  
Enter Name, Job Title, & Company Here

**Date:**

---

SUPPLEMENTAL INSTRUCTIONS NUMBER 000

Page 1



## REQUEST FOR PROPOSAL

CITY OF WORCESTER, MASSACHUSETTS

R.F.P. NUMBER:

000

R.F.P. DATE:

Date

---

**FOR THE PROJECT:**

DCU Center  
Refurbishment and Expansion  
50 Foster Street  
Worcester, MA 01608

**TO THE CONTRACTOR:**

Contractor Name  
Contractor Address

---

Please submit an itemized proposal to change the Contract Sum to complete the changes to the Work described below. Your proposal shall itemize all extra labor, materials, tools and equipment required to complete additional work within the contract time. Your proposal shall include costs associated with as-built record drawings preparation in accordance with specification section 017839 Project Record Documents. Include a change in the contract time only if requested below. Do not proceed with the changes described in this request until directed to do so in a Construction Change Directive. This Request, your Proposal and a Construction Change Directive to proceed with the changes will be included in a subsequent Change Order.

---

**DESCRIPTION:**

Enter Description Here

**ATTACHMENTS:**

List Attachments Here

**CC:**

**By:**

**Date:**

Enter Name, Job Title, & Company Here

CONTRACTOR'S NAME  
CONTRACTOR'S ADDRESS  
CONTRACTOR'S CITY, STATE, & ZIP CODE

P.C.O. NUMBER: 001

**PROPOSED CHANGE ORDER**

P.C.O. DATE: DATE

FOR THE PROJECT:

DCU CENTER  
REFURBISHMENT AND EXPANSION  
50 FOSTER STREET  
WORCESTER, MA 01608

TO THE CONTRACTING OFFICER:

CITY OF WORCESTER  
DEPARTMENT OF PUBLIC WORKS AND PARKS  
50 SKYLINE DRIVE  
WORCESTER, MA 01605

This form is provided to make the submission of your Proposed Change Order meet the requirements of Article 12.4 in the General Conditions.

DESCRIPTION OF PROPOSED CHANGE:

☐ Fixed Price

☐ Time & Material

Enter Description Here.

TOTAL PROPOSED CHANGE TO CONTRACT SUM

|        |        |
|--------|--------|
| Amount | \$0.00 |
|--------|--------|

TIME EXTENSION (Attach a Schedule if Additional Days are Required)

|  |                 |
|--|-----------------|
| Number of Calendar Days                          | 0               |
| The Date of Substantial Completion Would Then Be | August 27, 2004 |

Signed By: \_\_\_\_\_ Date: \_\_\_\_\_  
Project Manager's Name & Title

CONTRACTOR'S NAME  
CONTRACTOR'S ADDRESS  
CONTRACTOR'S CITY, STATE, & ZIP CODE

P.C.O. NUMBER: 001

**PROPOSED CHANGE ORDER**

P.C.O. DATE: DATE

CONTRACTOR'S NAME  
CONTRACTOR'S ADDRESS  
CONTRACTOR'S CITY, STATE, & ZIP CODE

P.C.O. NUMBER: 001

**PROPOSED CHANGE ORDER**

P.C.O. DATE: DATE

**GENERAL CONTRACTOR'S DIRECT LABOR BY OWN FORCES**

| Trade                      | Quantity | Hours | Rate | Unit | Effective Date of Rate | Expiration Date of Rate | Subtotal |               |
|----------------------------|----------|-------|------|------|------------------------|-------------------------|----------|---------------|
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
|                            |          |       |      | HR   |                        |                         | \$0.00   |               |
| <b>GC'S LABOR SUBTOTAL</b> |          |       |      |      |                        |                         |          | <b>\$0.00</b> |

**GENERAL CONTRACTOR'S DIRECT LABOR BURDEN**

| Insurance & Payroll Burdens - By Trade | Subtotal - By Trade | % | Subtotal |               |
|--|---------------------|---|----------|---------------|
| Workers' Compensation Insurance        |                     |   | \$0.00   |               |
| Federal Social Security                |                     |   | \$0.00   |               |
| Massachusetts Employment               |                     |   | \$0.00   |               |
|  |                     |   | \$0.00   |               |
|  |                     |   | \$0.00   |               |
|  |                     |   | \$0.00   |               |
|  |                     |   | \$0.00   |               |
| <b>GC'S LABOR BURDEN SUBTOTAL</b>      |                     |   |          | <b>\$0.00</b> |

**GENERAL CONTRACTOR'S MATERIALS**

| Material Item/Description      | Subtotal |               |
|--------------------------------|----------|---------------|
|                                |          |               |
|                                |          |               |
|                                |          |               |
|                                |          |               |
|                                |          |               |
|                                |          |               |
|                                |          |               |
| <b>GC'S MATERIALS SUBTOTAL</b> |          | <b>\$0.00</b> |

**GENERAL CONTRACTOR'S EQUIPMENT**

| Equipment Item/Description     | Subtotal |               |
|--------------------------------|----------|---------------|
|                                |          |               |
|                                |          |               |
|                                |          |               |
|                                |          |               |
|                                |          |               |
| <b>GC'S EQUIPMENT SUBTOTAL</b> |          | <b>\$0.00</b> |

CONTRACTOR'S NAME  
CONTRACTOR'S ADDRESS  
CONTRACTOR'S CITY, STATE, & ZIP CODE

P.C.O. NUMBER: 001

**PROPOSED CHANGE ORDER**

P.C.O. DATE: DATE

**FILED SUBCONTRACTOR'S LABOR, MATERIALS, & EQUIPMENT**

| Name of Subcontractor           | Subcontractor's Subtotal | 10% Mark-up             | Subtotal      |  |
|---------------------------------|--------------------------|-------------------------|---------------|--|
|                                 |                          | \$0.00                  | \$0.00        |  |
|                                 |                          | \$0.00                  | \$0.00        |  |
|                                 |                          | \$0.00                  | \$0.00        |  |
|                                 |                          | \$0.00                  | \$0.00        |  |
|                                 |                          | \$0.00                  | \$0.00        |  |
|                                 |                          | \$0.00                  | \$0.00        |  |
|                                 |                          | \$0.00                  | \$0.00        |  |
|                                 |                          | \$0.00                  | \$0.00        |  |
|                                 |                          | \$0.00                  | \$0.00        |  |
|                                 |                          | \$0.00                  | \$0.00        |  |
| <b>SUBTOTAL BEFORE OH&amp;P</b> | <b>\$0.00</b>            | <b>FILED SUBS TOTAL</b> | <b>\$0.00</b> |  |

**NON-FILED SUBCONTRACTOR'S LABOR, MATERIALS, & EQUIPMENT**

| Name of Subcontractor           | Subcontractor's Subtotal | 10% Mark-up                 | Subtotal      |  |
|---------------------------------|--------------------------|-----------------------------|---------------|--|
|                                 |                          | \$0.00                      | \$0.00        |  |
|                                 |                          | \$0.00                      | \$0.00        |  |
|                                 |                          | \$0.00                      | \$0.00        |  |
|                                 |                          | \$0.00                      | \$0.00        |  |
|                                 |                          | \$0.00                      | \$0.00        |  |
|                                 |                          | \$0.00                      | \$0.00        |  |
|                                 |                          | \$0.00                      | \$0.00        |  |
|                                 |                          | \$0.00                      | \$0.00        |  |
| <b>SUBTOTAL BEFORE OH&amp;P</b> | <b>\$0.00</b>            | <b>NON-FILED SUBS TOTAL</b> | <b>\$0.00</b> |  |

**GENERAL CONTRACTOR'S ALLOWABLE MARK-UP**

| Category for Mark-Up               | Subtotal Amount | %                            | Mark-Up Amount |  |
|------------------------------------|-----------------|------------------------------|----------------|--|
| General Contractor's Labor         | \$0.00          | 10.00%                       | \$0.00         |  |
| General Contractor's Labor Burden  | \$0.00          | 10.00%                       | \$0.00         |  |
| General Contractor's Material      | \$0.00          | 10.00%                       | \$0.00         |  |
| General Contractor's Equipment     | \$0.00          | 10.00%                       | \$0.00         |  |
| Filed Subcontractors Proposals     | \$0.00          | 5.00%                        | \$0.00         |  |
| Non-Filed Subcontractors Proposals | \$0.00          | 10.00%                       | \$0.00         |  |
|                                    |                 | <b>GC'S MARK-UP SUBTOTAL</b> | <b>\$0.00</b>  |  |

**SUBTOTALS**

|                                    | AMOUNT          |               |
|------------------------------------|-----------------|---------------|
| General Contractor's Labor         | \$0.00          |               |
| General Contractor's Labor Burden  | \$0.00          |               |
| General Contractor's Material      | \$0.00          |               |
| General Contractor's Equipment     | \$0.00          |               |
| Filed Subcontractors Proposals     | \$0.00          |               |
| Non-Filed Subcontractors Proposals | \$0.00          |               |
| General Contractor's Mark-Up       | \$0.00          |               |
|                                    | <b>SUBTOTAL</b> | <b>\$0.00</b> |

**INSURANCE & BONDS (Direct Premium Costs)**

| Description         | Subtotal Amount | %                                     | Amount        |  |
|---------------------|-----------------|---------------------------------------|---------------|--|
| Liability Insurance | \$0.00          | 0.00%                                 | \$0.00        |  |
| Bonds               | \$0.00          | 0.00%                                 | \$0.00        |  |
|                     |                 | <b>INSURANCE &amp; BONDS SUBTOTAL</b> | <b>\$0.00</b> |  |

|   |               |
|---|---------------|
| <b>TOTAL PROPOSED CHANGE ORDER AMOUNT</b> | <b>\$0.00</b> |
|---|---------------|





## CHANGE ORDER

CITY OF WORCESTER, MASSACHUSETTS

C.O. NUMBER:

000

C.O. DATE:

Date

---

**FOR THE PROJECT:**

DCU Center  
Refurbishment and Expansion  
50 Foster Street  
Worcester, MA 01608

**TO THE CONTRACTOR:**

Contractor Name  
Contractor Address

---

**The Contract is changed as follows:**

---

**SUMMARY OF THE CONTRACT PRICE**

|  |          |
|--|----------|
| Original Contract Sum  | \$ 00.00 |
| Net Change by Previously Authorized Change Order(s)  | \$ 00.00 |
| Contract Sum Prior to this Change Order  | \$ 00.00 |
| Contract Sum shall be Increased <del>Decreased</del> by this Change Order in the Amount of | \$ 00.00 |
| New Contract Sum including this Change Order   | \$ 00.00 |

**SUMMARY OF TIME FOR PERFORMANCE**

|  |        |
|--|--------|
| Date of Substantial Completion Prior to this Change Order            | Date   |
| Contract Time shall be Changed by this Change Order                  | 0 DAYS |
| Date of Substantial Completion as of the Date of the Change Order is | Date   |

Pursuant to Article 12 of the General Conditions To The Contract For Construction, the Owner (**City of Worcester**) and the Architect; **City of Worcester** issue this order to change the Work as described below, including the change, if any, to the Contract Sum or Contract Time. The Contractor's execution of this Change Order indicates its acceptance of the terms hereof, including any adjustment to the Contract Sum or Contract Time. If the Contractor shall not agree to the terms hereof, and chooses to contest the terms in accordance with the applicable provisions of the General Conditions, this Change Order shall nevertheless forthwith be returned to the Owner accompanied by the Contractor's written claim. In any case, the Contractor shall proceed in accordance with the instructions of this Change Order without further delay.

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CHANGE ORDER NUMBER 000

PAGE 1

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|                         |      |
|-------------------------|------|
| CHANGE ORDER NUMBER 000 | Date |
|-------------------------|------|

---

**CHANGE ORDER ITEMS:**

1. Enter CCD # & Description Here

|            |         |
|------------|---------|
| DEDUCT/ADD | \$ 0.00 |
| DEDUCT/ADD | 0 DAYS  |

---

|                           |                   |                |
|---------------------------|-------------------|----------------|
| <b>TOTAL OF ALL ITEMS</b> | <b>DEDUCT/ADD</b> | <b>\$ 0.00</b> |
|                           | <b>DEDUCT/ADD</b> | <b>0 DAYS</b>  |

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CHANGE ORDER NUMBER 000

PAGE 2

CHANGE ORDER NUMBER 000

Date

IN WITNESS WHEREOF, the parties hereto, by  
execution of this Change Order have caused the  
contract to be amended

this \_\_\_\_\_ day of \_\_\_\_\_, 2008

OWNERS PROJECT MANAGER  
MAGUIRE GROUP:

CONTRACTOR:

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Paul Moosey, Assistant Commissioner,  
Department of public Works and Parks

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Enter Name & Job Title Here

ARCHITECT,  
CITY OF WORCESTER

CONTRACTING OFFICER,  
CITY OF WORCESTER:

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Don Vitters, Project Manager  
Sasaki

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Robert L. Moylan, Commissioner,  
Department of Public Works and Parks

Approved as to legal form:

CITY MANAGER,  
CITY OF WORCESTER:

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Michael Traynor, Deputy City Solicitor  
City of Worcester

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Michael v O'Brien, City Manager

I certify that funds are available for this contract, as  
amended, in Account Number \_\_\_\_\_

By: \_\_\_\_\_ Date: \_\_\_\_\_  
James A. Delsignore, City Auditor

CHANGE ORDER NUMBER 000

PAGE 3



**CONSTRUCTION  
CHANGE DIRECTIVE**

CITY OF WORCESTER, MASSACHUSETTS

**C.C.D. NUMBER:**

**000**

**C.C.D. DATE:**

**Date**

**FOR THE PROJECT:**

**DCU Center  
Refurbishment and expansion  
50 Foster Street  
Worcester, MA 01608**

**TO THE CONTRACTOR:**

**Contractor Name  
Contractor Address**

**YOU ARE HEREBY DIRECTED TO MAKE THE FOLLOWING CHANGES IN THE CONTRACT  
AND COMPLETE THE WORK DESCRIBED BELOW:**

Add and/or Deduct from the contract the following:

Enter Description Here

This CCD will be included in Change Order # 000.

**THE PROPOSED BASIS OF ADJUSTMENT TO THE CONTRACT SUM IS:**

- ☐ LUMP SUM INCREASE OF \_\_\_\_\_
- ☐ LUMP SUM DECREASE OF \_\_\_\_\_
- ☐ UNIT PRICE OF \$ \_\_\_\_\_ PER \_\_\_\_\_
- ☐ \_\_\_\_\_

**THE PROPOSED ADJUSTMENT TO THE CONTRACT TIME IS:**

- ☐ INCREASE OF \_\_\_\_\_ DAYS
- ☐ DECREASE OF \_\_\_\_\_ DAYS
- ☐ NO CHANGE
- ☐ TO BE DETERMINED

SOUTH HIGH COMMUNITY SCHOOL

SECTION 012600 NEW

CONSTRUCTION

CONTRACT MODIFICATION

PROCEEDURES

CONSTRUCTION CHANGE DIRECTIVE NUMBER 000

Date

WHEN SIGNED BY THE ARCHITECT AND CONTRACTING OFFICER AND RECEIVED BY THE CONTRACTOR, THIS DOCUMENT BECOMES EFFECTIVE IMMEDIATELY AS A CONSTRUCTION CHANGE DIRECTIVE (C.C.D.) AND THE CONTRACTOR SHALL PROCEED WITH THE CHANGES DESCRIBED ABOVE.

SIGNATURE BY THE CONTRACTOR INDICATES THE CONTRACTOR'S AGREEMENT WITH THE PROPOSED ADJUSTMENTS IN THE CONTRACT SUM AND TIME SET FORTH IN THIS CONSTRUCTION CHANGE DIRECTIVE.

ARCHITECT  
City of Worcester

CONTRACTOR:  
ENTER COMPANY NAME HERE

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Don Vitters, Project Manager

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Enter Name & Job Title Here

CONTRACTING OFFICER  
CITY OF WORCESTER

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Paul Moosey, Assistant Commissioner,  
Department of Public Works and Parks

CONSTRUCTION CHANGE DIRECTIVE NUMBER 000

Page 2

END OF SECTION 012600

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Section 01 26 13  
REQUESTS FOR INTERPRETATION

**PART 1 – GENERAL**

1.1 SUMMARY

- A. Administrative requirements for Requests For Information (RFI's).

1.2 DEFINITIONS

- A. Requests For Information (RFI):
1. A document submitted by the Construction Manager to the Architect requesting clarification of a portion of the Contract Documents, hereinafter referred to as RFI.
  2. A properly prepared RFI shall include a detailed written statement that indicates the specific Drawings or Specification in need of clarification and the nature of the clarification requested.
    - a. Drawings shall be identified by drawing number and location on the drawing sheet.
    - b. Specifications shall be identified by Section number, page and paragraph.
    - c. The Construction Manager shall provide suggestions or alternate solutions to the RFI if such suggestions are known or should be known.
- B. Improper RFI's:
1. RFI's that are not properly prepared, as required above.

Improper RFI's will be processed by the Architect at the Architect's standard hourly rate and Architect will charge the Construction Manager, and such costs will be deducted from monies due the Construction Manager. The Construction Manager will be notified by the Architect through the Construction Manager of the "back charge" amounts.
- C. Frivolous RFI's:
1. RFI's that request information that is clearly shown on the Contract Documents.
  2. Frivolous RFI's will be returned unanswered.

1.3 CONSTRUCTION MANAGER'S REQUESTS FOR INFORMATION

- A. When the Construction Manager is unable to determine from the Contract Documents, the material, process or system to be installed, the Construction Manager shall submit an RFI to the Architect requesting a clarification of the indeterminate item.
1. When possible, such clarification shall be requested at the next appropriate project meeting, with the response entered into the meeting minutes. When clarification at the meeting is not possible, either because of the urgency of the need, or the complexity of the item the Construction Manager shall prepare and submit an RFI to the Architect.

- B. Individual Contractors and Each Trade Contractor shall endeavor to keep the number of RFI's to a minimum. In the event that the process becomes unwieldy, in the opinion of the Architect, because of the number and frequency of RFI's submitted, the Architect may require the Construction Manager to abandon the process and submit future requests as submittals, substitutions, or requests for change.
- C. RFI's shall be submitted on a form acceptable to the Architect. Forms shall be completely filled in, and if prepared by hand, shall be fully legible after photocopying or electronic transmission in PDF format. Each page of attachments to RFI's shall bear the RFI number in the lower right corner.
- D. RFI's shall be originated by the Construction Manager, individual contractors, or Trade Contractors as appropriate. Construction Manager shall endeavor to address and resolve Trade Contractor's RFI's to the extent possible for issues which are obviously covered by the Contract Documents, before forwarding to the Architect for processing.
  - 1. RFI's from subcontractors, Trade Contractors or material suppliers shall be submitted through, reviewed by, and signed by the Construction Manager prior to submittal to the Architect.
  - 2. RFI's shall be processed and sent to the Architect from the Construction Manager only. RFI's received by the Architect or the Architect's consultants from other parties shall not be accepted and will be returned unanswered.
- E. Each Trade Contractor shall carefully study the Contract Documents to assure that the requested information is not available therein. RFI's which request information available in the Contract Documents will be deemed either "improper" or "frivolous" as noted above.
- F. In cases where RFI's are issued to request clarification of coordination issues, for example pipe and duct routing, clearances, specific locations of work shown diagrammatically, and similar items, the Construction Manager shall fully lay out a suggested solution using drawings or sketches drawn to scale, and submit same with the RFI. RFI's, which fail to include a suggested solution, will be returned unanswered with a requirement that the Construction Manager submit a complete request.
- G. RFI's used for the following purposes will be returned without review:
  - 1. To request approval of submittals.
  - 2. To request approval of substitutions.
  - 3. To request coordination information already indicated in the Contract Documents.
  - 4. To request changes which entail adjustments in the Contract Time or the Contract Sum (additional cost or credit).
  - 5. To request different methods of performing work than those drawn and specified.
  - 6. To request interpretation of Architect/Engineer's actions on submittals.
  - 7. Incomplete RFI's or RFI's with numerous errors.



- H. In the event the Construction Manager believes that a clarification by the Architect results in additional cost or time, Construction Manager shall not proceed with the Work indicated by the RFI without a written authorization from the Architect. RFI's shall not automatically justify a cost increase in the Work or a change in the Schedule.
  - 1. Answered RFI's shall not be construed as approval to perform extra work.
  - 2. Unanswered RFI's will be returned with a stamp or notation: Not Reviewed.
- I. Construction Manager will prepare and maintain a log of RFI's and provide updated copies at the weekly Construction Progress Meetings showing outstanding RFI's.
- J. RFI Response: The Architect will endeavor to respond in a timely fashion to RFI's, however, the following minimum time periods are required. RFI's which are received by the Architect after 1PM local time shall be considered received on the following working day.
  - 1. RFI's which require only Architect's Response: Construction Manager shall allow up to Three (3) full work days review and response time,
  - 2. RFI's which require Architect's and an Engineering or Consultant Response: Construction Manager shall allow up to Four (4) full work days review and response time.

#### 1.4 ARCHITECT'S RESPONSE TO RFI'S

- A. Architect will respond to RFI's on one of the following forms:
  - 1. Properly prepared RFI's:
    - a. Response on the RFI form.
    - b. Architect's Supplemental Instruction.
    - c. Request for Proposal.

**PART 2 - PRODUCTS** (Not Used)

**PART 3 - EXECUTION** (Not Used)

End of Section

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## SECTION 012900

### APPLICATION FOR PAYMENT

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, are hereby made a part of this Section.
- B. Related Sections: Sections which contain requirements that relate to this Section include, but are not limited to the following:
  - 1. Section 00800
  - 2. Section 00900
  - 3. Section 00950
  - 4. Section 01230
  - 5. Section 01270
  - 6. Section 01300
  - 7. Section 01700

##### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the Progress Schedule, Schedule of Values, and Contractor's Applications for Payment.
  - 1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Project Progress Schedule, List of Subcontracts, and Submittal Schedule.
- B. The Contractor's Submittal Schedule and Project Progress Schedule are included in Specification Sections 01300 and 01325 respectively.

##### 1.3 PROGRESS SCHEDULE

- A. Prepare the Project Progress Schedule in accordance with Specification Section 00200- General Conditions, Article 8, for submittal to the Owner's Project Manager and approval by the Architect.
  - 1. The Progress Schedule shall conform to the requirements in Specification Section 01325. Reference to the terms Contractor's Progress Schedule,

Progress Schedule, Construction Schedule, or Project Schedule, within the Contract Documents shall mean Project Progress Schedule.

#### 1.4 SCHEDULE OF VALUES

- A. Coordinate preparation of the Schedule of Values with preparation of the Progress Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
    - a. Contractor's Progress Schedule.
    - b. Application for Payment forms.
    - c. List of products.
    - d. Schedule of allowances, if any.
    - e. Schedule of alternates, if any.
    - f. Schedule of unit prices, if any.
    - g. List of products.
    - h. List of principal suppliers and fabricators.
    - i. Schedule of submittals.
  - 2. Submit the preliminary Schedule of Values to the Architect and the Construction Manager at the earliest possible date, but no later than ten (10) days before the date scheduled for submittal of the initial Application for Payment. Submit the final Schedule of Values seven (7) days following the acceptance of the CPM Schedule.
- B. Format and Content: Use the Project Manual Table of Contents and the CPM Schedule of Activities to establish the format for the Schedule of Values. Provide at least one (1) line item for each Specification Section including all major divisions of work within each Section. The Schedule of Values must be coordinated with the Project Progress Schedule. Coordinate with the Owner's Project Manager and the Architect for the development of, and the required revisions to the preliminary Schedule of Values prior to submitting for approval by the Architect, the final Schedule of Values. Show all major categories of work including, but not limited to major equipment and project closeout submittals.
  - 1. Include the following Project identification on the Schedule of Values:
    - a. Project name and location.
    - b. Name of the Architect.
    - c. Project number.
    - d. Contractor's name and address.
    - e. Date of submittal.

2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
  - a. Generic name.
  - b. Related Specification Section.
  - c. Description of Work.
  - d. Name of subcontractor.
  - e. Name of manufacturer or fabricator.
  - f. Name of supplier.
  - g. Change Orders (numbers) that have affected value.
  - h. Percentage of Contract Sum to the nearest percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Breakdown shall be done by sequence. Coordinate with the Project Manual Table of Contents. Break principal subcontract amounts down into several line items, including but not limited to major equipment and project closeout submittals.
4. Do not round amounts off to the nearest whole dollar; carry all amounts out to the two (2) decimal places and the totals shall equal the Contract Sum.
5. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
6. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete, including its total cost and proportionate share of general overhead and profit margin for each item.
  - a. Temporary facilities, shop drawing, submittals, project closeout submittals, and other major cost items that are not direct cost of actual work-in-place shall be shown as separate line items in the Schedule of Values or distributed as general overhead expense, at the Contractor's option.
  - b. The Project Progress Schedule is an integral part of the Work. As such, it shall be shown on the Schedule of Values with a corresponding total cost.
7. Schedule Updating: Update and resubmit the Schedule of Values prior to the next Application for Payment when Change Orders or Construction Change Directives result in a change to the Contract Sum.
8. Contractor shall submit the draft Application for Payment to the Architect, through the Owner's Project Manager, an electronic version of the Application for Payment in an MS Excel spreadsheet format.

## 1.5 APPLICATION FOR PAYMENT

- A. Draft Application Preparation: Submit three (3) draft copies of the (current) Application for Payment at the weekly project meeting for Architect's review seven (7) days in advance of the "Payment Application Time" as indicated in the Agreement. Contractor shall submit the draft Application for Payment, in an electronic MS Excel spreadsheet format. The Architect will highlight areas requiring revision or clarification and return to the file to the Owner's Project Manager for transmittance to the Contractor.
1. Draft Application for Payment transmittal shall include the a fully executed Draft Cover Sheet or Periodic Submittal Certification Statement on Contractor letterhead (bound at the end of this section hereafter) certifying that the following Periodic Submittals are current for the appropriate period:
    - a. Originals of All Waivers of Mechanics Lien & Corresponding Logs Covering Status of All Waivers.
    - b. Certified payrolls.
    - c. Contract Compliance Submittals
    - d. Insurance and transfer title certificates for any material stored off site.
    - e. Updated as-built drawings of record reflecting Work for the current Application period.
- B. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner.
1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.
- C. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- D. Payment Application Cover Sheet Form: Complete the enclosed Application and Certification for Payment Cover Sheet on Contractor letterhead (bound at the end of this Section hereafter) and transmit with each Payment Application Form submittal.
- E. Payment Application Forms: Use AIA Document G 702 and Continuation Sheets G 703 as the form for Application for Payment. No exceptions will be made.
- F. Application Preparation: Complete every entry on the form, including notarization and execution by a person authorized to sign legal documents on

behalf of the Contractor. The Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
  2. Include only amounts of approved and fully executed Change Orders. Obtain approval from the Architect prior to inclusion into the Application.
  3. Each Application for Payment must be accompanied by an updated Project Progress Schedule. The format to which is subject to the Owner's Project Manager's and Architect's approval. The Architect will return the Application for Payment with "no action taken" if it is not submitted with an updated Project Progress Schedule.
- G. Payment for materials and/or equipment stored off site shall be considered upon the Owner's approved submission by the Contractor bill(s) of sale or such other documentation or procedures satisfactory to the Owner to establish the Owner's clear and legal title to such materials and/or equipment or otherwise provided to protect the Owner's interest. This shall include applicable insurance and transportation to the project site for those materials and/or equipment suitably stored off site under consideration for payment.
1. Any Contractor making an application for payment pursuant to Section 00200 – General Conditions, paragraph 9.3.2, shall provide the following written documentation to the Architect through the Construction Manager as delineated below and as otherwise maybe reasonably requested by the Owner:
    - a. Bill of Material, Purchase Order or Invoice Number.
    - b. Product Description Listing.
    - c. Serial Numbers (If Applicable)
    - d. Materials and/or Equipment (wares) shall be segregated from all other stock or equipment and clearly labeled and/or marked as City of Worcester Property.
    - e. Wares shall be available for inspection at all times and in any event within twenty-four (24) hours after receiving prior notice from the Owner/Architect.
    - f. Provide written directions from the project site to the location of the stored wares.
    - g. Name of contact person at the storage site and applicable telephone numbers.
    - h. Method and mode of transportation from off site storage location to the job site.
- H. Retainage: In accordance with the Supplemental General Conditions, the Awarding Authority (Owner) shall deduct a retainage not exceeding five (5)

percent of the approved amount of the periodic payment. The aforesaid five (5) percent retainage deduction by the Owner is the only retainage authorized hereunder. The contractor shall not deduct any amounts from payments received on behalf of subcontractors, except those deductions specifically authorized by M.G.L. Chapter 30, Section 39 (1) (a).

1. Upon the initial and any subsequent Application for Payment; requesting or reflecting a "Release of Retainage" provide a Summary cover sheet indicating the derivation arithmetically, by each line item, of the total released to date and the of the current total retainage sum.
- I. Transmittal: Upon receipt of the required periodic submittals enumerated above and upon approval of the "Draft Application", submit six (6) fully executed and notarized original copies with Cover Sheet of the current Application for Payment to the Architect by means ensuring receipt within twenty-four (24) hours. One (1) copy shall be complete, including waivers of lien and similar attachments.
  1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Architect.
  2. With each requisition, after the first requisition, submit one (1) copy of updated as-built drawings for all underground and concealed work, showing locations, depths, or elevations.
- J. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of mechanics lien from every entity who may lawfully be entitled to file a mechanics lien arising out of the Contract, and related to the Work covered by the payment.
  1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
  2. When an application shows completion of an item, submit final or full waivers.
  3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Waiver Delays: Submit each Application for Payment with the Contractor's waiver of mechanics lien for the period of construction covered by the previously paid application.
    - a. Submit final Application for Payment with, or preceded by, final waivers from every entity involved with performance of Work covered by the application that could lawfully be entitled to a lien.
  5. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to Owner.



K. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:

1. List of subcontractors; at all tiers.
2. List of principal suppliers and fabricators.
3. Approved Schedule of Values.
4. Contractor's Project Progress Schedule, see Section 01325.
5. Schedule of principal products.
6. Submittal Schedule (preliminary, if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations, permits and licenses from governing authorities for performance of the Work.
11. Initial progress report.
12. Report of pre-construction meeting.
13. Schedule of Pre-installation meetings.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Data needed to acquire Owner's insurance.
17. Initial settlement survey and damage report, if required.
18. List of Contractor's personnel names and titles assigned on the project and emergency telephone numbers.

L. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment.

1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
2. Administrative actions and Submittals that shall precede or coincide with this application include:
  - a. Occupancy permits and similar approvals.
  - b. Warranties (guarantees) and maintenance agreements.
  - c. Test/adjust/balance records.
  - d. Maintenance instructions.
  - e. Meter readings.
  - f. Start-up performance reports.
  - g. Changeover information related to Owner's occupancy, use, operation and maintenance.
  - h. Final cleaning.
  - i. Application for reduction of retainage, and consent of surety
  - j. Advice on shifting insurance coverage.

- k. Final progress photographs.
  - l. List of incomplete work, recognized as exceptions to Architect's Certificate of Substantial Completion.
- M. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final payment Application for Payment include the following:
- 1. Completion of Project closeout requirements.
  - 2. Completion of items specified for completion after Substantial Completion
  - 3. Assurance that unsettled claims will be settled.
  - 4. Assurance that incomplete Work and Work not accepted will be completed without undue delay.
  - 5. Transmittal of required Project construction records to the Owner.
  - 6. Certified property survey.
  - 7. Proof that taxes, fees and similar obligations have been paid.
  - 8. Removal of temporary facilities and services.
  - 9. Removal of surplus materials, rubbish and similar elements.
  - 10. Change of door locks to Owner's access.
  - 11. Order of Conditions Certificate of Compliance, if applicable.
- N. Application Review: The Architect, Construction Manager, and their respective Consultants are permitted fourteen (14) days to review the application for payment. Within such time the Application will either be returned to the Contractor for correction or certified by the Architect and forwarded to the Owner for payment.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

CONTRACTOR LETTER HEAD

APPLICATION AND CERTIFICATION FOR PAYMENT COVER SHEET

PROJECT: APPLICATION NO: \_\_\_\_\_

For Period: \_\_\_\_\_

Ending: \_\_\_\_\_

AMOUNT CERTIFIED: \$\_\_\_\_\_

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief, the Work covered by this Application for Payment has been completed in accordance with the Contract Documents; and the current Payment shown herein is now due.

The Contractor further certifies that the entire amount of all previous Payments received for labor performed and materials furnished have been promptly paid to all Subcontractors whose work was certified for payment on previous applications, less, where applicable, only an amount specified in any court proceeding barring such payment and/or an amount claimed due from the Subcontractor by the Contractor as expressly authorized by M.G. L. Chapter 30, Section 39F (1) (a). No other amounts have been deducted or retained from such payments by the contractor.

Contractor: \_\_\_\_\_ STATE OF: \_\_\_\_\_

Signed by: \_\_\_\_\_ COUNTY OF: \_\_\_\_\_

Date: \_\_\_\_\_

Subscribed and sworn to before me  
on this \_\_\_\_\_ Day of  
20 .

Notary public:

\_\_\_\_\_

My Commission Expires:

\_\_\_\_\_

APPROVED FOR PAYMENT:

Signed: \_\_\_\_\_ Signed: \_\_\_\_\_

By: \_\_\_\_\_

Date: \_\_\_\_\_ Date: \_\_\_\_\_

Signed: \_\_\_\_\_ Signed: \_\_\_\_\_

By: \_\_\_\_\_

By: \_\_\_\_\_

Date: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_

CONTRACTOR LETTER HEAD

DRAFT APPLICATION FOR PAYMENT PERIODIC  
SUBMITTAL CERTIFICATION STATEMENT

Project Name: Draft Application Date: \_\_\_\_\_

Draft Application No. \_\_\_\_\_ (Requisition No.)

For Period:  
Starting \_\_\_\_\_  
Through Period  
Ending \_\_\_\_\_

\_\_\_\_\_, (Name \_\_\_\_\_ of \_\_\_\_\_ Contractor)  
, certifies that the "Draft Application for Payment" as herein submitted with all of the following Periodic Submittals fully and completely executed and current for the appropriate time period(s) as required.

FURNISH THE FOLLOWING PERIODIC SUBMITTALS AND PROVIDE ALL REQUIRED INFORMATION FOR THE APPROPRIATE TIME PERIOD(S) AS REQUESTED. PLEASE SUBMIT ON SEPARATE SHEETS:

- I. Original Waivers of Mechanic Lien: List every entity who may be lawfully entitled to file a lien resulting out of this Contract, including but not limited to; contractors/subcontractors, at all tiers, vendors, and suppliers. Submit current originals of all Waivers covering all WORK completed through the period ending thirty (30) days prior to this periods "Application" date and as further required in I above.
- II. Certified Payrolls: All payroll reports have been submitted as required by the Contract Compliance Office.
- III. Contract Compliance Reports: All contract compliance reports have been submitted as required by the Contract Compliance Office.
- IV. Insurance & Title Transfer Certificates for material stored off site, if applicable.
- V. Updated As-Built Drawings: Record drawings have been submitted reflecting the work completed up to the time of Application.

This Draft Application for Payment Certification Statement and corresponding Periodic Submittals (attached) shall be reviewed by the Awarding Authority for completeness. Any deficiency, discrepancies or missing items shall cause this Draft Application for Payment to be returned to the Contractor with no action taken.

SOUTH HIGH COMMUNITY SCHOOL  
NEW CONSTRUCTION

SECTION 012900  
APPLICATION FOR PAYMENT

I, \_\_\_\_\_ hereby certify,  
that the Periodic  
(Name of contractor)

Submittals indicated herein have been reviewed by the undersigned and are complete and current  
as required under provisions of this Contract.

\_\_\_\_\_  
(Name of Authorized Person) (Date)  
\_\_\_\_\_  
(Title)

END OF SECTION 012900

## **SECTION 013000**

### **SUBMITTALS**

#### **PART 1 - GENERAL**

##### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, are hereby made part of this Section.
  - 1. The submittals enumerated below shall require review and/or approval by the Architect.
- B. Refer to Specification Section 01315 – Project Management Communications for additional Procore information.

##### **1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including:
  - 1. Contractor's construction progress schedule.
  - 2. Major delivery schedule.
  - 3. Existing utility tie-in's schedule.
  - 4. Submittal schedule.
  - 5. Pre-Installation Conference Schedule (By Specification Section).
  - 6. Daily construction reports.
  - 7. Shop drawings.
  - 8. Product data.
  - 9. Samples.
  - 10. Quality assurance submittals.
  - 11. Submittal of three (3) sets of stamped plans and specifications, complete with all addendums posted, to the City of Worcester Building Department to obtain building permit.
- B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
  - 1. Product Substitution.
  - 2. Periodic Submittals.
  - 3. Permits.
  - 4. Applications for Payment.
  - 5. Performance and payment bonds.

6. Insurance Certificates.
  7. List of Project Contractors, Subcontractors, Vendors, etc.
  8. List of Personnel and Emergency Telephone Numbers.
  9. City Ordinance Program Forms.
  10. LEEDv4 submittals.
- C. The Schedule of Values submittal is included in Section 01027 "Applications for Payment".
- D. "Project Closeout", Section 01700, specifies requirements for submittal of Project Record Documents and warranties at project closeout.

### 1.3 ELECTRONIC SUBMITTAL PROCEDURES

- A. All submittals shall be submitted following the appropriate guideline as outlined below:
1. **Fully Electronic Submittals** – Any submittal that is 8-1/2" x 11" in format shall be submitted in an electronic format as an attachment to the submittal form within the Procore Site. Refer to Specification Section 01315 – Project Management Communications for additional information regarding the Procore System.
    - a. For the electronic submission referred to above, only one (1) copy needs to be sent electronically to the Architect. Do not send "books" of multiple product information, i.e. "Plumbing Fixtures" as one submittal. Make each fixture a separate submittal and identify each submittal separately.
    - b. The electronic files shall be submitted in one of the following formats:
      - (i) A scan at 150 dpi of an original paper document as an Adobe Acrobat file (also known as a .pdf), a JPEG image file (also known as a .jpg), or a TIFF image file (also known as a .tif)
      - (ii) An original file created by a contractor, subcontractor, or supplier as a Microsoft Word file (also known as a .doc), a Microsoft Excel file (also known as a .xls), an Adobe Acrobat file (also known as a .pdf), a JPEG image file (also known as a .jpg), or a TIFF image file (also known as a .tif).
      - (iii) A download file from the internet as a Microsoft Word file (also known as a .doc), a Microsoft Excel file (also known as a .xls), an Adobe Acrobat file (also known as a .pdf), a JPEG image file (also known as a .jpg), or a TIFF image file (also known as a .tif).
      - (iv) Documents other than scans of original paper documents, original files, and downloaded files from the internet may be submitted electronically as long as they are submitted as an



AutoCAD drawing file (also known as a .dwg), a DXF drawing file (also known as a .dxf), a Microsoft Word file (also known as a .doc), a Microsoft Excel file (also known as a .xls), an Adobe Acrobat file (also known as a .pdf), a JPEG image file (also known as a .jpg), or a TIFF image file (also known as a .tif).

- (v) Any and all notes, hand corrections made to any submittal are to be made in black marker in a style darker (broader or bolder) than the plotted lines for easy recognition.
  - c. For these fully electronic submittals, each applicable party to a submittal shall be responsible for making their own copies for the purposes of review and record keeping.
  - d. All fully electronic submittals will be reviewed and any mark-ups to those submittals will be returned as an electronic attachment, when they are returned to the Contractor.
  - e. Approved submittals will be promptly posted in the Procore Documents section under Approved Submittals.
2. **Original Document Submittals Requiring Approvals**– Any submittal that has a format larger than 8-1/2” x 11”, such as shop drawings or physical samples, that require original submissions shall be entered into the Procore system and have the submittal form printed and attached as the transmittal cover sheet to the original submittal documents that will be mailed, shipped, or hand delivered to the Architect.
- a. For the electronic submittal cover sheet and original document submission referred to above. The contractor shall submit to the Architect. The Architect will mark-up, correct, and grade the submittal and return to the Owner’s Project Manager, and return to the Contractor. The Contractor shall make and pay for additional copies of the marked-up submission as needed.

(\*) Number as required for sub-contractors.

(\*) Number as required for Contractor’s records.

(4) Copies for the Owner’s Project Manager and Owner .  
Construction

Manager shall post the final submission on Team Builder as follows.

***For submittals requiring consultant’s review increase the contractor’s submittal number to six (6) copies.***

- b. One (1) copy of all approval submittals in this category will be posted, in an electronic form, to the Procore Site by the Owner's Project Manager as an AutoCAD drawing file (also known as a .dwg), a DXF drawing file (also known as a .dxf), a Microsoft Word file (also known as a .doc), a Microsoft Excel file (also known as a .xls), an Adobe Acrobat file (also known as a .pdf), a JPEG image file (also known as a .jpg), or a TIFF image file (also known as a .tif).
  - c. For original documents not requiring approvals the contractor shall transmit as indicated above and submit (6) six copies to the Owner's Project Manager for their distribution to the Owner, Architect, and their Consultants, and will post on Procore as indicated above.
- B. Processing: All Contractors are directed to the timeliness and critical importance of expediting the submittal process. Any lead times, which may impact sequencing, should be prioritized to meet the project schedule. Architect and Owner's Project Manager must be notified if any delays arise that will impact lead times.
- C. Submittal Preparation: For all submittals the Construction Manager shall fill out a submittal form on the TeamBuilder Site. For all **Fully Electronic Submittals**, the General Contractor shall just attach all applicable electronic files to that submittal form on the site. For all **Original Document Submittals**, the General Contractor shall print a copy of the submittal form and use it as a transmittal with the submission. Also, place a permanent label or title block on each **Original Document Submittal** for identification. The label shall indicate the name of the entity that prepared each submittal on the label or title block.
  - 1. Provide a space approximately 4 by 5 inches on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
  - 2. Include the following information on the label for processing and recording action taken.
    - a. Project name.
    - b. Date.
    - c. Name and address of the Architect.
    - d. Name and address of the Contractor.
    - e. Name and address of the subcontractor.
    - f. Name and address of the supplier.
    - g. Name of the manufacturer.
    - h. Number and title of appropriate Specification Section.

- i. Drawing number and detail references, as appropriate.
- D. Submittal Transmittal: For each **Original Document Submittal**, the submittal form filled out and printed from the TeamBuilder site shall function as the transmittal. Package each of these submittals appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Owner's Project Manager. The Owner's Project Manager will not accept submittals received from sources other than the General Contractor, nor will the Architect accept submittals directly for the General Contractor.
- E. On the submittal form in TeamBuilder, record relevant information, requests for data, and record deviations from Contract Document requirements, including variations and limitations. The General Contractor shall include on the TeamBuilder submittal form his certification that information complies with Contract Document requirements by providing his grade of the submittal.

#### 1.4 SUBMITTAL COORDINATION

- A. Coordination of Submittals: Coordinate preparation and processing of submittals with related construction activities. Transmit submittals sufficiently in advance of performance of Work to avoid delays. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related pertinent activities that require sequential activity.
  1. Architect may reject, or withhold action on submittals requiring coordination with other submittals until related submittals are received.
- B. Processing of Submittals: Allow sufficient review time to ensure installation will not be delayed because of time required to process submittals. Minimum processing times after the submission times established in the submittal schedule are as follows:
  1. Review by Architect's Office Only: Allow ten business days for review and processing, per submittal per building. ***Allow 20 business days for hollow metal doors, hardware, millwork and other project wide detailed items.***
  2. Review by Architect and Consultant: Allow ten business days for review and processing of submittals by Architect, and an additional ten business days for review by each consultant, per submittal per building. Allow 20 business days for temperature control systems, package HVAC rooftop units, and other project wide detailed items.
  3. Reprocessing of Submittals: For submittals not approved initially, allow ten business days for review and reprocessing of submittals by

Architect, and an additional ten business days for review by each consultant, per submittal per building.

4. No extension of Contract Time will be authorized due to failure to transmit submittals sufficiently in advance of scheduled performance of Work.
  5. Submittals must be sequenced. Multiple submittals must be prioritized by General Contractor.
  6. Allow minimum fifteen business days to process.
  7. Interior and exterior color selections will not be made until all colors for products requiring selections have been received by Architect. Allow thirty business days for final selections once all color submittals have been received.
- C. Contractor's Preparation of Submittals: Submit each submittal with the Architect's transmittal form, a copy of which is attached at the end of this Section. Place permanent label or title block on each submittal for identification. Indicate Project Name, Architect's Project Number, Specification Section number and title, date of submittal, name and address of Architect, name and Address of Contractor, name and address of subcontractor and/or supplier, name of manufacturer, Drawing number and detail reference.
1. Contractor's Review and Action Stamp: Provide suitable space on label or title block for Contractor's review and action stamp. Stamp and sign each submittal to show Contractor's review and approval prior to transmittal to Architect. Submittals not signed and stamped or the appropriate electronic version of the approval by Contractor will be returned without action.
  2. Only submittals received from the General Contractor will be considered for review by the Architect. All submittals prepared by subcontractors or suppliers shall be processed through the Contractor. The Contractor shall review each submittal carefully for accuracy and conformance with the requirements of the Contract Documents, and particularly for field measurements and proper fit with adjoining work, and shall affix a stamp or electronic cover sheet containing the following wording, or a similar statement approved in advance by the Architect:

APPROVED FOR CONFORMANCE WITH THE  
CONTRACT DOCUMENTS.

All Dimensions and Quantities Have Been Reviewed and Are Accepted  
by *<Here insert name of General Contractor>*. All Dimensions and

Field Conditions Have Been or Will Be Verified PRIOR to Fabrication  
of the Items Described Herein.”

3. Submittals shall be signed by a responsible representative of the Contractor. Items not bearing an acceptable certification will be returned unchecked. Submittals improperly prepared or inadequately reviewed by the Contractor (“rubber stamped” submittals) will be returned unchecked. Claims for delay due to the return of uncertified, improperly prepared, or inadequately reviewed submittals will be rejected.
  4. Architect's Review and Action Stamp: Provide minimum 4 in. x 4 in. space on label or title block for Architect's review and action stamp. Deliver submittals to Architect at address listed on cover of Project Manual.
  5. Modify and customize submittals as required to show interface with adjacent work and attachment to building.
- D. Transmittal of Submittals: Transmit each item with Architect's transmittal form, a copy of which is attached at the end of this Section. Identify Project, Contractor, subcontractor, major supplier; identify pertinent Drawing sheet and detail number, and Specification section number, as appropriate, on transmittal form.
1. Source: Submittals received from sources other than Contractor will be returned without action.
  2. Deviations from Contract Documents: When products, materials, or systems submitted deviate from Contract Documents, record deviations clearly on transmittal form, or separate attached sheet.
- E. Comply with progress schedule for submittals related to Work progress.
- F. After Architect reviews submittal, revise and resubmit as required. Identify changes made since previous submittal. Changes not marked will be treated as having not been made, even if change is consistent with Contract Documents.
- G. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report inability to comply with provisions.
- H. Incorporate all shop drawing and submittal data including but not limited to sizes, mounting requirements, clearances, power requirements, and all other requirements into the coordination drawings specified under section 01040 PROJECT COORDINATION

## **1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE**

- A. Refer to Section 012900, Application for Payment.

## **1.6 SUBMITTAL SCHEDULE**

- A. Within fifteen calendar days following the award of the Contract, the Contractor shall submit a detailed Schedule of Submittals, identifying the date by which the submittals required under each Section of the Specifications, including Administrative Submittals required in this Section or elsewhere, will be delivered to the Architect. The schedule shall relate submittals to the orderly progress of the work, indicating critical dates for approval of materials. Submittal schedule to be approved by Architect.
- B. In preparing the schedule, the Contractor shall allow reasonable time for normal checking and processing of each submittal or resubmittal.
- C. Content of Submittal Schedule: Prepare schedule in order by Specification Section. Provide the following information for each submittal:
  - 1. Scheduled date of initial submittal.
  - 2. Specification Section number and paragraph.
  - 3. Submittal type.
  - 4. Name of subcontractor or supplier.
  - 5. Identify submittals requiring color selection.
- D. Upon approval of this schedule by the Architect, The Contractor shall ensure that all submittals are properly prepared and delivered to the Architect by the scheduled dates. Failure to adhere to the Schedule of Submittals may be considered by the Architect in reviewing the progress of the work for purposes of approving payments or evaluating claims for delays or additional cost.
- E. Contractor shall use a computerized system for tracking the submittal process. Software systems similar to Expedition or Prolog will be acceptable. The system shall uniquely number and track each submittal. At a minimum, the following reports shall be published on a bi-weekly basis: complete listing of required submittals, complete listing of submittals to date, complete listing of approved submittals, complete listing of rejected submittals, complete listing of submittals returned for correction, both with and without re-submittal required, and listing of outstanding submittals. Reports shall be capable of being sorted by approval status, by subcontractor/supplier, by submission date and by days late, days under review, etc.

- F. Update the submittal schedule periodically as the work progresses. Submit an updated copy of the Submittal Schedule as part of each application for payment.
- G. Distribution: Print and distribute Submittal Schedule to Architect, Owner, subcontractors, and other parties affected. Post copies in field office.
- H. Revisions: Update and reissue Submittal Schedule monthly in conjunction with Application for Payment.

## **1.7 SHOP DRAWINGS**

- A. Provide accurately prepared, large scale and detailed shop drawings prepared specifically for this Project on format as specified in section 1.3 above. Show adjacent conditions and related work. Show accurate field dimensions where appropriate. Identify materials and products shown. Note special coordination required. Standard information prepared without specific reference to Project is not considered shop drawings.
- B. Shop drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings.
- C. Show every component of fabricated item, notes regarding manufacturing process, coatings and finishes, identifying numbers conforming to Contract Documents (i.e. stair numbers, door numbers, etc.), dimensions, and appropriate trade names. Show anchorage and fastening details, including type, size and spacing. Show material gage and thickness. Indicate welding details and joint types.
- D. Include references to all product data as required.
- E. Shop Drawing Sheet Size: Except for templates, patterns, and other full-size drawings, submit shop drawings on sheets at least 8-1/2 in. x 11 in., but no larger than 32 in. x 48 in.
- F. Submittal Quantities: refer to Section 1.3 above
- G. Refer to each individual division 2 through 16 for specific requirements in addition to those outlined herein.

## **1.8 PRODUCT DATA**

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts,

roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings".
  2. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:
    - a. Manufacturer's printed recommendations.
    - b. Compliance with trade association standards.
    - c. Compliance with recognized testing agency standards.
    - d. Application of testing agency labels and seals.
    - e. Notation of dimensions verified by field measurement.
    - f. Notation of coordination requirements.
- A. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
- B. Unless non-compliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
- C. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
1. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
  2. Do not permit use of unmarked copies of Product Data in connection with construction.

## 1.9 SAMPLES

- A. Mount or display samples in the manner to facilitate review of qualities indicated. Prepare samples to match the Architect's sample. Include the following:
1. Specification Section number and reference.
  2. Generic description of the sample.
  3. Sample source.
  4. Product name or name of the manufacturer.
  5. Compliance with recognized standards.
  6. Availability and delivery time.



- B. Submit samples for review of size, kind, color, pattern, and texture. Submit samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
- C. Preliminary Submittals: Submit a full set of choices where samples are submitted for selection of color, pattern, texture, or similar characteristics from a range of standard choices.
  - 1. Preliminary submittals will be reviewed and returned with the Architect's mark, indicating selection and other action.
- D. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit five (5) sets. One (1) set will be returned marked with the action taken.
  - 1. Maintain sets of samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.
- E. Unless non-compliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
  - 1. Sample sets may be used to obtain final acceptance of the construction associated with each set.

#### **1.10 QUALITY ASSURANCE SUBMITTALS**

- A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.
- B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements; submit a notarized certification from the manufacturer certifying compliance with specified requirements.
  - 1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.

#### **1.11 SAMPLE WALL & CLASSROOM**

- A. Sample Wall:  
A Construction Sample Wall/Roof is required to be in place for Architect approval. All components to be included but are not limited to: masonry, fiberglass reinforced plastic, waterproofing, damp proofing and caulking,

building insulation, roofing, door frames, windows and gypsum sheathing system. All color submittals for the construction sample shall be processed in a timely manner as outlined in these specifications in order to meet this deadline. The sample wall to be constructed is shown on the drawings indicating all materials to be incorporated. Remove wall toward the end of the project as scheduled with the Owner's Project Manager.

**B. Sample Classroom:**

A sample classroom shall be constructed 30 days following the enclosure of the building. The classroom shall be complete in all respects including: finishes, millwork, unit ventilator and shelving, doors, lighting and electrical devices, clock/speaker unit and marker board/tack board units. Refer to the submittal section of the specifications for submittal schedule requirements related to the deadline for the sample classroom. The sample classroom will be used as a model for construction and for color approval by the Architect.

**1.12 REPETITIVE REVIEW**

- A. Shop Drawings, Product Data and Samples submitted for each item will be reviewed no more than two times at Owner's expense. Submittals failing to comply with Contract requirements will be reviewed at times convenient to the Architect and its consultants and at the Contractor's expense, based upon a flat rate of \$75.00 per hour not to exceed \$600.00 for each subsequent re-submittal. Contractor shall reimburse Owner for such additional submittal reviews monthly, and Owner reserves the right to deduct said reimbursement from Contractor's periodic application for payment and the Contract Sum.

**1.13 WEEKLY REPORTS**

- A. Beginning immediately after starting work on the Project, submit a weekly report on each Monday by 12:00 Noon for all work performed the previous week. Each report shall be prepared and signed by the Contractor's Superintendent, and shall contain the following information:
1. Contractor: the type of materials and/or major equipment being installed and the average number of employees working in each category that particular week. Payroll records shall be submitted showing wages paid in conformance with minimum wage rates in effect.
  2. Subcontractors: the names of the subcontractors working and the type of materials and/or major equipment being installed by each, together with the average number of employees of each subcontractor working in each category that particular week.

3. Equipment: the Contractor's construction equipment on site. Identify as idle or approximate hours in use, rental or owned.

#### **1.14 DAILY REPORTS**

- A. Submit daily all information required by the Owner, including the following:
  1. Manpower: provide an accurate count of all subcontractor and Contractor personnel, by trade, operating under the Contract. Include identification of employees meeting requirements for minority or resident employment obligations.
  2. Work performed: provide a description of the work performed and major equipment utilized.
  3. Equipment: the Contractor's construction equipment on site. Identify as idle or approximate hours in use, rental or owned.
  4. Accidents, safety violations, safety notices issued.
  5. Meetings and significant decisions.
  6. Visitors, inspections by authorities having jurisdiction, etc.
  7. Stoppages, delays, shortages, losses.
  8. Meter readings and similar recordings, monthly.
  9. Emergency procedures, field orders.
  10. Orders/requests by governing authorities.
  11. Services connected, disconnected.
  12. Equipment or system tests and start-up.
  13. Partial completions and occupancies.
  14. Substantial Completions certified.
  15. Cubic yards of concrete placed during a day, location of placement, tests performed, total cubic yardage placed to date.
  16. Weather conditions and temperature, noted at start of work, mid-day, and end of day.

### **1.15 CONSTRUCTION PHOTOGRAPHS**

- A. General: Employ competent professional photographer to take construction record photographs monthly during course of Work.
- B. Provide photographs taken during and at completion of major stages of construction, including:
  - 1. Site preparation.
  - 2. Excavation.
  - 3. Foundations.
  - 4. Steel framing.
  - 5. Masonry work.
  - 6. Roofing work.
  - 7. Interior partitions and framing.
  - 8. Interior finishes.
  - 9. Finish site work.
- C. View and Quantities Required: At each specified time, photograph each school from four different views approved by Architect. Provide three prints of each view.
- D. All photography shall be digital. Aerial drone shots at 6-month intervals are required.
- E. Costs of Photography: Pay costs for specified photography and prints. Parties requiring additional photography or prints will pay photographer directly. Furnish additional prints to Owner and Architect at commercial rates applicable at time of purchase.
- F. Prints: Provide 8 in. x 10 in. color prints on single weight print paper. Provide smooth surface, glossy finish.
- G. Identify each print on back, listing name of Project, orientation of view, date and time of exposure, name and address of photographer, and numbered identification of exposure.

- H. Techniques: Provide factual presentation, with correct exposure and focus, with high resolution and sharpness, maximum depth-of-field, and minimum distortion.
- I. Views Required: Illustrate condition of construction and state of progress. At successive periods of photography, take at least one photograph from same overall view as previously. Consult with Architect at each period of photography for instructions concerning views required.
- J. Delivery of Prints: Photos shall be logged, recorded and posted on E-Builder within 10 days of the end of each month.

#### **1.16 SCHEDULE OF VALUES**

- A. Refer to Section 01027, Applications for Payment.

#### **1.17 ARCHITECT'S ACTION**

- A. General: Architect will review submittals, stamp and indicate action, and return to Contractor. Architect will review submittals for conformance with design intent only. Architect's review and approval of submittals shall be held to limitations stated in the Conditions of the Contract. In no case shall approval or acceptance by Architect be interpreted as release of Contractor of responsibility to fulfill requirements of Contract Documents. No acceptance or approval of submittals, nor any indication or note marked by Architect on submittals, shall constitute authorization for increase in Contract Sum.
- B. Action Stamp: Architect will stamp each submittal with an action stamp. Stamp sample is indicated below:

|  |   |
|--|---|
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> No Exceptions       | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Make Corrections |
| <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Revise and Resubmit | <input type="checkbox"/> Rejected <input type="checkbox"/> Submit                           |

Architect's review is only for general conformance with design concept and compliance with requirements of Contract Documents. Review is based on Contractor's representation that he has checked and approved this submittal and has verified dimensions, quantities, field dimensions, relation to existing work, coordination with work to be installed later, and coordination with information in previously approved submittals. Accuracy of all such information is responsibility of the Contractor.

Approval does not authorize, or relieve the Contractor of responsibility for, deviations from drawings, specifications, supplementary documents furnished by the Architect, or previously approved submittals unless the Contractor has, in writing, called the Architect's attention to such deviations at the time of submittal. The Contractor is solely responsible for the accuracy of all information in the submittal and for details of fabrication and installation. Refer to Contract Documents for further submittal requirements and limitations on scope of the Architect's review.

**LAMOUREUX, PAGANO ASSOCIATES, ARCHITECTS**

Date: \_\_\_\_\_ By: \_\_\_\_\_

C. Stamp indicates action taken as follows:

1. "NO EXCEPTIONS TAKEN": No corrections, no marks:  
Resubmission not required.
2. "MAKE CORRECTIONS NOTED": Minor amount of corrections; all items can be fabricated without further corrections to original submittal; checking is complete and all corrections are deemed obvious without ambiguity. Resubmission not required.
3. "REVISE AND RESUBMIT": Minor corrections required; items noted shall not be fabricated until further corrections of original submittal is completed and Architect-approval is obtained; checking is complete; clarify details of items noted by checker for approval; items without marks may be fabricated without further submittal. Resubmission required.
4. "REJECTED": Submittal does not conform to Contract Documents, and requires too many corrections, or is rejected for other justifiable reasons. Architect will state reasons for rejection. Correct and resubmit. Do not fabricate.
5. "SUBMIT SPECIFIED ITEM": No item, other than item specified, will conform to the Contract Documents. Architect will state reasons. Resubmit Specified Item. Do not fabricate.

D. Other Action: Submittal for information or record purposes will be returned with no action marked.

E. Required Re-submittals: Make corrections or changes to submittals required by Architect and resubmit until approved. Revise initial shop drawings or

product data, and resubmit as specified for initial submittal. Indicate changes made other than those requested by Architect. Submit new samples as required for initial submittal.

**1.18 DRAWINGS TO BUILDING DEPARTMENT**

- A. Contractor shall submit three (3) sets of fully conformed plans and specification to the City of Worcester Building Department upon application for the building permit.
  - 1. Submit drawings to architect prior to permit application for "wet stamping" of architect and engineers professional seal to the drawings. Allow up to three (3) days for this process.
  - 2. Any reduction in addenda plan must be legible.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable)**

**END OF SECTION 01300**

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## **SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section.

#### **1.2 SUMMARY**

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Coordination Drawings.
  - 2. Administrative and supervisory personnel.
  - 3. Project meetings.
  - 4. Requests for Information (RFIs).
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections include the following:
  - 1. Division 00 Section 00 73 00b “BIM Requirements for Subcontractors”.
  - 2. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
  - 3. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 4. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.
  - 5. Division 01 Section 013150 “Project Management Communications” for electronic document submissions.

#### **1.3 DEFINITIONS**

- A. RFI: Request for Information from the Contractor seeking an interpretation or clarification of the Contract Documents submitted to the Architect in electronic form on Procore.

#### **1.4 COORDINATION**

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
  - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's Construction Schedule.
  - 2. Preparation of the Schedule of Values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Progress meetings.
  - 6. Preinstallation conferences.
  - 7. Project closeout activities.
  - 8. Startup and adjustment of systems.
  - 9. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

## **1.5 SUBMITTALS**

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
  - 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
    - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - b. Indicate required installation sequences.
    - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect. Minor dimension changes and difficult installations will not be considered changes to the Contract.
  - 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 36 by 48 inches.
  - 3. Number of Copies:
    - a. Submit three (3) opaque copies of each submittal for resolution of conflicts to the Architect who will return one (1) copy.
    - b. Submit five (5) opaque copies of final Coordination Drawings which reflect the as-built work. **Coordination Drawings are not Project Record Drawings as specified in Section 017839 - Project Record Drawings.**
  - 4. Refer to individual Sections for additional coordination drawing requirements for Work in those Sections.
- B. Key Personnel Names: Within fifteen (15) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, and field office and cell or mobile telephone numbers, home office telephone numbers. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.
- C. Emergency List: Provide names, addresses, home, cell or mobile telephone, and office telephone numbers of individuals assigned to be notified and respond in an emergency during work hours and after normal work hours and who are authorized to order emergency work to be done to protect persons and property. Organize the list so that the first person to be called is the first person on the list. The Architect will furnish this list to the city's "911" dispatcher.

## 1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

## **1.7 PROJECT MEETINGS**

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
  - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  - 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Owner's Project Manager, and Architect, within three (3) days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner, Owner's Project Manager, and Architect, but no later than twenty-one (21) days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
  - 1. Attendees: Authorized representatives of Owner, Owner's Project Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Procedures for processing field decisions and Change Orders.
    - f. Procedures for RFIs.
    - g. Procedures for testing and inspecting.
    - h. Procedures for processing Applications for Payment.
    - i. Submittal procedures.
    - j. LEED and/or MACHPS requirements.
    - k. Preparation of Record Documents.
    - l. Use of the premises and existing building.
    - m. Work restrictions.
    - n. Owner's occupancy requirements.
    - o. Responsibility for temporary facilities and controls.

- p. Construction waste management and recycling.
  - q. Parking availability.
  - r. Office, work, and storage areas.
  - s. Equipment deliveries and priorities.
  - t. Safety Training.
  - u. First aid.
  - v. Security.
  - w. Progress cleaning.
  - x. Working hours.
3. Minutes: Record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Owner's Project Manager of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Options.
    - b. Related RFIs.
    - c. Related Change Orders.
    - d. Purchases.
    - e. Deliveries.
    - f. Submittals.
    - g. Review of mockups.
    - h. Possible conflicts.
    - i. Compatibility problems.
    - j. Time schedules.
    - k. Weather limitations.
    - l. Manufacturer's written recommendations.
    - m. Warranty requirements.
    - n. Compatibility of materials.
    - o. Acceptability of substrates.
    - p. Space and access limitations.
    - q. Testing and inspecting requirements.
    - r. Installation procedures.
    - s. Coordination with other work.
    - t. Protection of adjacent work.
    - u. Protection of construction and personnel.
  - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at monthly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner, Owner's Project Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Work hours.
      - 10) Hazards and risks.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Status of correction of deficient items.
      - 14) Field observations.
      - 15) RFIs.

- 16) Status of proposal requests.
  - 17) Pending changes.
  - 18) Status of Change Orders.
  - 19) Pending claims and disputes.
  - 20) Documentation of information for payment requests.
3. Minutes: Record the meeting minutes.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
    - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Coordination Meetings: Conduct Project coordination meetings at monthly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, Owner's Project Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    - c. Review present and future needs of each contractor present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.

- 5) Off-site fabrication.
  - 6) Access.
  - 7) Site utilization.
  - 8) Temporary facilities and controls.
  - 9) Work hours.
  - 10) Hazards and risks.
  - 11) Progress cleaning.
  - 12) Quality and work standards.
  - 13) Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

## **1.8 REQUESTS FOR INFORMATION (RFIs)**

- A. Procedure: Immediately on discovery of the need for interpretation or clarification of the Contract Documents prepare and submit via Procore an RFI in the electronic form specified. No discussion in meetings or other correspondence shall be used for this purpose.
  1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
  2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
  3. The RFI shall request a single interpretation or clarification appropriate to the phase of construction.
    - a. Lists of multiple questions covering a variety of subjects will be returned to the Contractor to be closed and removed from the current list. Example: "1) What is the light fixture designated L-29? 2) Can other data wiring colors be used in lieu of the specified colors? 3) Is the electrical contractor responsible for coring 3" diameter holes in floor slabs?" These and similar questions should be asked on individual RFIs which will allow each to be answered appropriately.
    - b. Interpretation or clarification far in the advance of construction work being done or in advance of approved submittals will be returned to the Contractor to be closed and removed from the current list. Example: "What is the floor tile color for the toilet rooms?" When asked before floor tile submittals have been submitted or approved.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
  1. RFI number, automatically numbered sequentially, by Procore.



2. Subject.
  3. Author.
  4. Date Created.
  5. Date Due.
  6. Specification Section.
  7. Information Requested.
  8. Attachments shall be electronic files in Adobe Acrobat PDF format. Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation as Attachments:
    - a. Specification Section number and title and related paragraphs, as appropriate.
    - b. Drawing number and detail references, as appropriate.
    - c. Field dimensions and conditions, as appropriate.
    - d. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
    - e. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
  9. Hard-Copy Attachments: Print a copy of the Procore RFI and include the copy with and hard copy materials. Identify each page of attachments with the RFI number and sequential page number.
- C. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow ten (10) working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for coordination information already indicated in the Contract Documents.
    - d. Requests for adjustments in the Contract Time or the Contract Sum.
    - e. Requests for interpretation of Architect's actions on submittals.
    - f. Incomplete RFIs or RFIs with numerous errors.
    - g. RFIs with for more than one interpretation or clarification.
    - h. RFI for interpretation or clarification for future work.
    - i. Requests for the location of items of work in the Contract Documents shall be answered by the Contractor.
- D. Architect's action may include a request for missing or additional information, in which case Architect's time for response will start again.

- E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if Contractor disagrees with response.
- F. If the Contractor believes the Architect's action on an RFI response warrants a change in the Contract Time or the Contract Sum according to Division 01 Section "Contract Modification Procedures," notify Architect and Owner's Project Manager in writing within ten 10 working days of receipt of the RFI response.
- G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs submitted to the Architect, organized by the RFI number, monthly as a 11" x 8 ½" Microsoft Excel Spreadsheet.
  - 1. Heading:
    - a. Project name.
    - b. Name and address of Contractor.
    - c. Name and address of Architect.
    - d. Owner's Project Manager.
  - 2. Footing:
    - a. Date of Log.
    - b. Page Number and Number of Pages.
  - 3. Columns:
    - a. RFI number (include all sequential RFI numbers).
    - b. RFI Subject.
    - c. Date the RFI was submitted to the Architect.
    - d. Date the Response was returned to the Contractor.
    - e. Incomplete information. Date the RFI was resubmitted with additional information to the Architect.
    - f. Date the Response to the resubmitted RFI was returned to the Contractor. Response is a minor change, no change in contract sum or time is required, or the response requires a change in contract sum or time.
    - g. Date notice for a change in contract sum or time is submitted to the Architect for a Request for Proposal (RFP).
    - h. Date the Request for Proposal (RFP) was received by the Contractor.
    - i. Record the Request for Proposal (RFP) Number.

**PART 2 - PRODUCTS (Not**

**Used) PART 3 - EXECUTION**

**(Not Used)**

## **SECTION 013150 - PROJECT MANAGEMENT COMMUNICATIONS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section.
- B. Refer to specification SECTION 01300 – SUBMITTALS and SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION for additional information.

#### **1.2 SUMMARY**

- A. The Construction Manager and Sub-contractors are invited to join the Architect, Consultants, Owner's Project Manager, and Owner in the Internet based communications and document storage service provided by Procore® 6 during this project through the end of commissioning. Contractor and Sub-contractor users should contact the Architects to be added as a user and pay the per user fee of \$600 per year directly to Procore.
- B. The use of Procore® does not replace or change any contractual responsibilities of the participants. The project database is on-line and fully functional.
- C. Users: User registration, payment of user fees, electronic and computer equipment, and Internet connections are the responsibility of each participant. The sharing of user accounts is prohibited. Each communication is tracked by the system and provides evidence of delivery upon opening by the user. User accounts are not to be used as "company" accounts and must be to an individual within a company.
- D. Training: Procore® will provide one 3 ½ hour group training session scheduled by the Architect the cost of which will be paid for by the city. Generally there will be a morning and afternoon training session in one day. Users may attend the scheduled training sessions on a first come first served basis. The contractor may request additional training sessions at his expense which will be honored by Procore when possible.
- E. Support: Procore® 6 provides extensive on-line help files and on-going support for the system.
- F. Project Archive: The project is intended to be available on-line indefinitely. A DVD archive may be ordered at cost. The archive set will contain only documents that the user had security access to during construction. All legal rights in any discovery process

are retained. Archive material shall be ordered from Procore® and is subject to the approval of the Architect.

- G. Copyrights and Ownership: Nothing in this specification or the subsequent communications supersedes the parties' obligations and rights for copyright or document ownership as established by the Contract Documents. The use of CAD files, processes or design information distributed in this system is intended only for the project specified herein. Any other use is prohibited without prior written permission of the author or document owner.
- H. Purpose: The intent of using Procore® is to improve project work efforts by promoting timely initial communications and responses. Secondly, to reduce the number of paper documents while providing improved record keeping by creation of electronic document files.
- I. Requirements and Cost: The Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers are urged to use Procore® during construction of this project through the twelve (12) month commissioning period after the date of Substantial Completion.
  - 1. The Owner has provided the Procore® service. The Contractor and his sub-contractors and suppliers should consider obtaining user licenses according to the following schedule:
    - a. Contract value under \$ 100,000 no user required.
    - b. Contract value \$100,000 through \$1,000,000 provide one (1) user.
    - c. Contract value \$100,000 through \$2,000,000 provide two (2) users.
    - d. Contract value \$100,000 through \$3,000,000 provide three (3) users.
    - e. Contract value \$100,000 through \$4,000,000 provide four (4) users.
    - f. Contract values over \$4,000,000 provide additional users as needed by a contractor.
  - 2. The Contractor should strongly urge his sub-contractors and suppliers to obtain user licenses within 15 days commencing the execution of the Owner / Contractor Agreement. Procore® training will be scheduled and commence within 30 days thereafter. Each user will receive a training session at a facility within the City.
- J. Authorized Users: Access to the web site will be by individuals who are licensed users.
  - 1. Individuals may use the User Application included in these specifications or may request the User Application separately.
  - 2. Submit completed user application forms one for each user, pay the user fee on-line and keep your receipt.
  - 3. Licensed users will be contacted directly through Procore®, and be assigned a temporary user password.
  - 4. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.

- K. Administrative Users: Administrative users have access and control of user licenses and all posted items. PLEASE DO NOT POST PRIVATE OR YOUR COMPANY'S CONFIDENTIAL ITEMS IN THE DATABASE! Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s).
- L. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using Procore® to send messages. Communication functions are as follows:
1. Document Integrity and Revisions:
    - a. Documents, comments, drawings and other records posted to the system remain for the project record. The authorship time and date is recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp is the method used to make modifications or corrections.
    - b. It is easy to identify revised or superseded documents and their predecessors.
  2. Document Security:
    - a. The system provides shall for security group assignment to respect the contractual parties communication except for Administrative Users. DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!
  3. Document Integration:
    - a. Documents of various types may be logically related to one another and discoverable. For example, requests for information, daily field reports, supplemental sketches and photographs can be referenced as related records.
  4. Reporting:
    - a. On-line report summaries are available for work in progress, and for each documents. Summary reports generated by the system shall be available for team members.
  5. Notifications and Distribution:
    - a. Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document distribution to parties outside of the project communication system may be accomplished by email of outgoing documents and attachments, readable by a standard email client.
  6. Required Document Types:
    - a. RFI, Request for Information.
    - b. Submittals, including record numbering by drawing and specification section.
    - c. Transmittals, including record of documents and materials delivered in hard copy.
    - d. Meeting Minutes.
    - e. Application for Payments (Draft or Pencil).

- f. Review Comments.
  - g. Daily Field Reports.
  - h. Construction Photographs.
  - i. Drawings.
  - j. Supplemental Sketches.
  - k. Schedules.
  - l. Specifications.
- M. Record Keeping: Except for paper documents, which require original signatures and large format documents (greater than 8½ x 11 inches), all other 8½ x 11 inches documents should be submitted in electronic form on Procore® web site by users.
- N. The Owner and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier shall respond to documents received in electronic form on the web site, and consider them as if received in paper document form.
  - 1. The Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier reserves the right to and shall reply or respond by transmissions in electronic form on the web site to documents actually received in paper document form.
  - 2. The Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier reserves the right to and shall copy any paper document into electronic form and make same available on the web site.
    - a. The following are some but not all of the paper documents which require original signature:
      - 1) Contract
      - 2) Change Orders
      - 3) Application & Certificates for Payment
      - 4) Construction Change Directives (CCD)
      - 5) Forms and reports in Sections 00800, 00900, & 00950
- O. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, an effective personal computer system is needed for users:
  - 1. User should have a high-speed Internet access, i.e. DSL, local cable company's Internet connection, or T1 connection.
  - 2. Minimum system<sup>1</sup> and software requirements:
    - a. Desktop or laptop configuration:
      - 1) PC system 1000 MHz Intel Pentium III or equivalent AMD processor
      - 2) Or, Macintosh 660 AV (Power PC)
      - 3) 512 MB Ram
      - 4) Display capable of SVGA (1024 x 768 pixels) 256 colors display

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<sup>1</sup> The minimum system herein will not be sufficient for many tasks and may not be able to process all documents and files stored in the TeamBuilder® Documents area.

- 5) 101 key Keyboard
- 6) Mouse or other pointing device
- b. Operating system and software shall be properly licensed.
  - 1) Internet Explorer or other browser (current version is a free distribution for download). This specification is not intended to restrict the host server or client computers provided that industry standard HTTP clients may access the published content.
  - 2) Adobe Acrobat Reader (current version is a free distribution for download).
  - 3) Or, users intending to scan and upload to the documents area of e-Builder® should have Adobe Acrobat current version must be purchased or equivalent.
  - 4) Users should have the standard Microsoft Office Suite 2003 version or the equivalent.
  - 5) Users may download the latest free distribution of viewers, by Autodesk, if they do not have other CAD software able to view Autocad drawing files. An effort will be made to keep the dwf drawings updated from the dwg files.PRODUCTS (Not Applicable.)

**PART 2 - EXECUTION (Not Applicable.)**

**END OF SECTION 01310**

User Application Form follows this page.

Procore® User Application For  
South High Community School

(Use a separate form for each user.)

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Trade, Product or Service - Description)

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
(Last Name) (First Name) (M.I.)

\_\_\_\_\_  
(Title)

\_\_\_\_\_@

\_\_\_\_\_  
(Email Address)

\_\_\_\_\_  
(Company Name)

\_\_\_\_\_  
(Address)

\_\_\_\_\_  
(Mailing Address, if different.)

\_\_\_\_\_  
(Telephone) (Fax)

\_\_\_\_\_  
(Cell Phone) (Pager)



Mail or Fax to:       Jeremy Flansburg, Project Architect  
                          Department of Public Works & Parks, Architectural Services  
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## SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Preliminary Construction Schedule.
  - 2. Contractor's Construction Schedule.
  - 3. Submittals Schedule.
  - 4. Daily construction reports.
  - 5. Material location reports.
  - 6. Field condition reports.
  - 7. Special reports.
- B. Related Sections include the following:
  - 1. Division 01 Section "Multiple Contract Summary" for preparing a combined Contractor's Construction Schedule.
  - 2. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
  - 3. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
  - 4. Division 01 Section "Photographic Documentation" for submitting construction photographs.
  - 5. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
  - 6. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

#### 1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
  - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
  - 2. Predecessor Activity: An activity that precedes another activity in the network.

- 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
  - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
  - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
  - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- H. Major Area: A story of construction, a separate building, or a similar significant construction element.
- I. Milestone: A key or critical point in time for reference or measurement.
- J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.
- K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

#### 1.4 SUBMITTALS

- A. Submittals Schedule: Submit three (3) copies of schedule. Arrange the following information in a tabular format:
  - 1. Scheduled date for first submittal.

2. Specification Section number and title.
  3. Submittal category (action or informational).
  4. Name of subcontractor.
  5. Description of the Work covered.
  6. Scheduled date for Architect's and Owner's Project Manager's final release or approval.
- B. Preliminary Construction Schedule: Submit two (2) opaque copies.
1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.
- C. Preliminary Network Diagram: Submit two (20 opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Submit two (20 opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
1. Submit an electronic copy of schedule, Adobe Acrobat pdf file, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.
- E. CPM Reports: Concurrent with CPM schedule, submit three (3) copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
  2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
  3. Total Float Report: List of all activities sorted in ascending order of total float.
  4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.
- F. Daily Construction Reports: Submit two (2) copies at weekly intervals.
- G. Material Location Reports: Submit two (2) copies at monthly intervals.
- H. Field Condition Reports: Submit two (2) copies at time of discovery of differing conditions.
- I. Special Reports: Submit two (2) copies at time of unusual event.

## 1.5 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
1. Review software limitations and content and format for reports.
  2. Verify availability of qualified personnel needed to develop and update schedule.
  3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
  4. Review delivery dates for Owner-furnished products.
  5. Review schedule for work of Owner's separate contracts.
  6. Review time required for review of submittals and resubmittals.
  7. Review requirements for tests and inspections by independent testing and inspecting agencies.
  8. Review time required for completion and startup procedures.
  9. Review and finalize list of construction activities to be included in schedule.
  10. Review submittal requirements and procedures.
  11. Review procedures for updating schedule.

## 1.6 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
1. Secure time commitments for performing critical elements of the Work from parties involved.
  2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

## PART 2 - PRODUCTS

### 2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
  2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those

required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

## 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for commencement of the Work and the Notice to Proceed to date of Final Completion.
  1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
  1. Activity Duration: Define activities so no activity is longer than twenty (20) days, unless specifically allowed by Architect.
  2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
    - a. Insert list of major items or pieces of equipment.
  3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
  4. Startup and Testing Time: Include days for startup and testing.
  5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Owner's Project Manager's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
  1. Phasing: Arrange list of activities on schedule by phase.
  2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
4. Work Restrictions: Show the effect of the following items on the schedule:
  - a. Coordination with existing construction.
  - b. Limitations of continued occupancies.
  - c. Uninterruptible services.
  - d. Partial occupancy before Substantial Completion.
  - e. Use of premises restrictions.
  - f. Provisions for future construction.
  - g. Seasonal variations.
  - h. Environmental control.
5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
  - a.
  - b. Submittals.
  - c. Purchases.
  - d. Mockups.
  - e. Fabrication.
  - f. Sample testing.
  - g. Deliveries.
  - h. Installation.
  - i. Tests and inspections.
  - j. Adjusting.
  - k. Curing.
  - l. Startup and placement into final use and operation.
6. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
  - a. Structural completion.
  - b. Permanent space enclosure.
  - c. Completion of mechanical installation.
  - d. Completion of electrical installation.
  - e. Substantial Completion.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
  1. Insert additional milestones not indicated elsewhere.



- F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
  - 1. Refer to Division 01 Section "Payment Procedures" for cost reporting and payment procedures.
  - 2. Contractor shall assign cost to construction activities on the CPM schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with Architect's approval, be assigned to fabrication and delivery activities. Costs shall be under required principal subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
  - 3. Each activity cost shall reflect an accurate value subject to approval by Architect.
  - 4. Total cost assigned to activities shall equal the total Contract Sum.
- G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.
- H. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules. Provide one (1) full complete working copies of the software to the Owner's Project Manager.
  - 1. Software shall be able to compare prior schedule to current and list the differences between the two versions.

## 2.3 CONTRACTOR'S PROGRESS SCHEDULE

- A. Provide a Bar-Chart Schedule prior to the first application for payment, see Section 013300, 1.4 for requirements and sample.

## 2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Preliminary Network Diagram: Submit diagram within 14 days of date established for commencement of the Work. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30days after date established for commencement of the Work.
    - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
  2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
  3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
  4. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
    - a. Preparation and processing of submittals.
    - b. Mobilization and demobilization.
    - c. Purchase of materials.
    - d. Delivery.
    - e. Fabrication.
    - f. Utility interruptions.
    - g. Installation.
    - h. Work by Owner that may affect or be affected by Contractor's activities.
    - i. Testing[ and commissioning].
  2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
  3. Processing: Process data to produce output data on a computer-drawn, time- scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
  4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

- E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
  2. Description of activity.
  3. Principal events of activity.
  4. Immediate preceding and succeeding activities.
  5. Early and late start dates.
  6. Early and late finish dates.
  7. Activity duration in workdays.
  8. Total float or slack time.
  9. Average size of workforce.
  10. Dollar value of activity (coordinated with the Schedule of Values).
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
  2. Changes in early and late start dates.
  3. Changes in early and late finish dates.
  4. Changes in activity durations in workdays.
  5. Changes in the critical path.
  6. Changes in total float or slack time.
  7. Changes in the Contract Time.
- G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
  2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
  3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
  4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
    - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    - b. Submit value summary printouts one week before each regularly scheduled progress meeting.

## 2.5 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (refer to special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial Completions and occupancies.
19. Substantial Completions authorized.

- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

## 2.6 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect[, Owner's Project Manager,] Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
  - 1. Post copies in Project meeting rooms and temporary field offices.
  - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200



## SECTION 014000 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section..

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Provide specific quality-assurance and comply with quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to facilitate quality-assurance and quality-control services required by Architect, Owner, Owner's Project Manager, or authorities having jurisdiction are not limited by provisions of this Section.
    - a. Structural Tests and Inspections of the completed work in-place paid for by the Owner:
      - 1) Soils under foundations and slabs-on-grade.
      - 2) Concrete Materials.
      - 3) Structural Steel, and metal deck.
      - 4) Miscellaneous Metal Stairs.
      - 5) Light Gage Metal Framing.
    - b. Building, Plumbing and Gas, Wiring, Fire Protection, Fire Alarm, Food Service, Elevator, Architectural Access and other inspections by authorities having jurisdiction.
- C. Related Sections include the following:

1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
2. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
3. Divisions 02 through 49 Sections for specific test and inspection requirements.

### 1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Owner's Project Manager.
- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.
- E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.



1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five (5) previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

#### 1.4 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

#### 1.5 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  1. Specification Section number and title.
  2. Description of test and inspection.
  3. Identification of test and inspection methods.
  4. Number of tests and inspections required.
  5. Entity responsible for performing tests and inspections.
- C. Reports: Prepare and submit certified written reports that include the following:
  1. Date of issue.
  2. Project title and number.
  3. Name, address, and telephone number of testing agency.
  4. Dates and locations of samples and tests or inspections.
  5. Complete test or inspection data.

6. Test and inspection results and an interpretation of test results.
  7. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  8. Name and signature of laboratory inspector.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

## 1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
  2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- G. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect

installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
  2. Notify Architect and Owner's Project Manager seven (7) days in advance of dates and times when mockups will be constructed.
  3. Demonstrate the proposed range of aesthetic effects and workmanship.
  4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    - a. Allow seven (7) days for initial review and each re-review of each mockup.
  5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  6. Demolish and remove mockups when directed.

#### 1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
  2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  2. Notify testing agencies at least [24] <Insert number> hours in advance of time when Work that requires testing or inspecting will be performed.

3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect[, Owner's Project Manager,] and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect[, Owner's Project Manager,] and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Delivery of samples to testing agencies.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency.

7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
  1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.
  1. Distribution: Distribute schedule to Owner, Architect, Owner's Project Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### 1.8 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
  1. Structural Tests and Inspections of the completed work in-place paid for by the Owner:
    - a. Soils under foundations and slabs-on-grade.
    - b. Concrete Materials.
    - c. Structural Steel, and metal deck.
    - d. Miscellaneous Metal Stairs.
    - e. Light Gage Metal Framing.

#### PART 2 - PRODUCTS (Not Used)

#### PART 3 - EXECUTION

##### 3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
  1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. Date test or inspection results were transmitted to Architect.
  4. Identification of testing agency or special inspector conducting test or inspection.

- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's, and Owner's Project Manager's, reference during normal working hours.

### 3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000



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Section 01 41 00  
REGULATORY REQUIREMENTS

**PART 1 - GENERAL**

1.1 SUMMARY

- A. This Section consists of:
1. Applicable codes and regulations.
  2. Trade union jurisdictions.
  3. Wage rate compliance.

1.2 DEFINITIONS

- A. Regulations include laws, ordinances, statutes and lawful orders issued by authorities having jurisdiction, and rules, conventions and agreements within the construction industry that control performance of the Work, whether lawfully imposed by authorities having jurisdiction or not.

1.3 APPLICABLE CODES AND REGULATIONS

- A. All work shall be performed in accordance with the latest version, by DATE OF ISSUE for Contract Documents, current on date of Owner-Contractor Agreement, except as indicated otherwise, of all applicable codes including the following:
1. 2015 International Building Code (IBC) with Massachusetts Building Code, Ninth Edition amendments (780 CMR).
  2. 2015 International Energy Conservation Code with Massachusetts Building Code amendments, (Effective August 12, 2016 under the 780 CMR, Eighth Edition).
  3. 2015 International Mechanical Code (IMC).
  4. Massachusetts Electrical Code (2017 National Electrical Code [NFPA 70, 2017 edition], with Massachusetts modifications from 527 CMR 12.00).
  5. Massachusetts Fuel, Gas, and Plumbing Code (2002 National Fuel Gas Code [ANSI Z223.1-NFPA 54], with Massachusetts modifications from 248 CMR 5.00).
  6. Massachusetts Comprehensive Fire Safety Code (527 CMR) [2012 NFPA 1 as amended], effective January 1, 2015, as amended through November 4, 2016 and MGL Chapter 148.
  7. Commonwealth of Massachusetts Regulation 521 CMR: *Architectural Access Board*.
  8. Commonwealth of Massachusetts Regulation CMR 38:00 - *Regulations For Governing School Building Assistance Act*, Chapter 645, 603.
  9. Massachusetts Board of Elevator Regulations (524 CMR).
  10. Commonwealth of Massachusetts, Department of Public Works. "STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES CONSTRUCTION".
  11. Commonwealth of Massachusetts Wetlands Protection Act.
  12. City of [???] Zoning Regulations / Ordinance , as amended.

13. National Fire Protection Association: NFPA 101 - LIFE SAFETY CODE, 2012 Edition.
14. National Fire Protection Association: NFPA 241 – *Standard for Safeguarding Building Construction And Demolition Operations*, 2013 Edition.
15. United States Occupational Safety and Health Administration (OSHA): Standard N°. 29-CFR-1926.59 - HAZARD COMMUNICATION STANDARD.
16. United States Department of Justice, N° 28 CFR Part 36 - AMERICANS WITH DISABILITIES ACT, (Public Law 101-336).

- B. Publication Dates: Where the date of issue of a code or regulation is not specified, comply with the standard in effect as of date of Contract Documents, or as otherwise required by authorities having jurisdiction.

#### 1.4 TRADE UNION JURISDICTIONS

- A. Maintain current information on jurisdictional matters, regulations, actions and pending actions; and administer/supervise performance of Work in a manner which will minimize possibility of disputes, conflicts, delays, claims or losses.

#### 1.5 WAGE RATE COMPLIANCE

- A. The General Contractor is responsible to ensure that the rate per hour to be paid to mechanics, apprentices, teamsters, laborers and other workers employed on the Work shall not be less than the approved wage rates applicable to this project. A legible copy of the approved rates, along with equal opportunity requirements, shall be posted on a weatherproof bulletin board outside the field office and be clearly visible for review by all workers.

#### **PART 2 - PRODUCTS** (Not Used)

#### **PART 3 - EXECUTION** (Not Used)

End of Section

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Section 01 41 17  
UTILITIES NOTIFICATION

**PART 1 – GENERAL**

**1.1 GENERAL PROVISIONS**

- A. Comply with all regulations and laws concerning excavation, demolition, or explosive work and be advised of utility notification requirements under Chapter 82, Section 40 of the Massachusetts General Laws.

**1.2 ADMINISTRATIVE AUTHORITY**

- A. Notification of utilities within the Commonwealth is performed through the Utilities Underground Plant Damage Prevention System, commonly referred to as “Dig Safe”.

**1.3 REGULATORY REQUIREMENTS**

- A. Construction Managers must notify “Dig Safe” by telephone before performing any earth moving operations including: digging, trenching, boring, site demolition, excavation, backfilling, grading, or explosive work in all public ways and private property.
- B. This notification must be made at least 72 hours (excluding weekends and holidays) prior to the Work described above, but not more than 30 calendar days before commencement of the contemplated Work. Notification shall occur between 6:00 AM to 6:00 PM local time from Monday to Friday, except in cases of emergency.
  - 1. The toll free phone number is: **811**.
  - 2. Provide the following information:
    - a. Municipality.
    - b. Location of work.
    - c. Intersecting street.
    - d. Type of work.
    - e. Starting date and time of work.
    - f. Name and title of caller.
    - g. Phone number of caller.
    - h. Best time for “Dig Safe” to return calls.
    - i. Company name of Construction Manager.
    - j. Company name of Trade Construction Manager or subcontractor performing subgrade work.
- C. Member utilities of the Utilities Underground Plant Damage Prevention System are required to respond to the notice within 72 hours from the time said notice is received by designating at the locus the location of pipes, mains, wires, or conduits.

1. Locations of underground utilities will be marked by spray paint or stakes. Marks will be color coded with additional descriptions of letters and arrows as required.
  - D. Do not commence work until "Dig Safe" has been properly notified and has responded as described above.
  - E. Subsequently notify "Dig Safe" of unanticipated additional blasting required after the initial notification to "Dig Safe" has been made. Do not perform the additional blasting work in less than 4 hours following the subsequent notification.
- 1.4 PROTECTION
- A. The Construction Manager is fully responsible for protection of the utility location markings, wherever these occur, on or off-site.
  - B. Perform Work in such a manner, and with reasonable precautions taken to avoid damage to utilities under the surface in said areas of work. Immediately notify any known or suspected damage to underground utilities to the owner of such utilities.

**PART 2 - PRODUCTS** (not used)

**PART 3 - EXECUTION** (not used)

End of Section

## **SECTION 014200 - REFERENCES**

### **A. GENERAL**

#### **1.2 RELATED DOCUMENTS**

- A. Retain or delete this article in all Sections of Project Manual.
- B. Attention is directed to the Contract and General Conditions and all Sections within Division 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section.

#### **1.3 DEFINITIONS**

- A. Terms defined in this article are not defined in the General Conditions. See Evaluations for discussion on whether definitions are necessary and whether they should be included here or in the Supplementary Conditions.
- B. Retain this article or selected paragraphs in article if definitions below are not included elsewhere in Project Manual.
- C. General: Basic Contract definitions are included in the Conditions of the Contract.
- D. When using terms such as those in first two paragraphs below, do not extend Architect's responsibility into Contractor's area of means, methods, and techniques of construction. See Evaluations.
- E. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- F. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- G. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- H. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- I. Avoid revising first three paragraphs below because of widespread acceptance and understanding of these terms as defined.

- J. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- K. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- L. Installer: An Installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
  - 1. The term experienced, when used with the term Installer, means having a minimum of five (5) previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.
  - 2. Trades: Using terms such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
  - 3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no choice or option. However, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.
    - a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.
- M. "Provide": Furnish and install, complete and ready for the intended use.
- N. Generally retain paragraph below; revise to suit Project. See Evaluations.
- O. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.
- P. Testing Agencies: A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

#### 1.4 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 33 Division format and MASTERFORMAT numbering system.
- B. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
  - 1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated, shall be interpolated, as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
  - 2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.
  - 3. The words "shall be" are implied wherever a colon (:) is used within a sentence or phrase.

## 1.5 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Retain first paragraph below unless Specifications are revised to insert dates (which is not recommended). Unreferenced standards are not applicable. Revise effective date of the standard established below to suit Project.
- C. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- D. Retain paragraph below on projects where copies of standards are needed. A requirement to retain many standards on a project site could become expensive. See Evaluations.
- E. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
- F. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

## 1.6 ABBREVIATIONS AND ACRONYMS

- A. Retain list of Federal agencies below if required. The Section Text in MASTERSPEC Sections is prepared assuming list is retained.

1.7 Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

|      |  |                                  |
|------|--|----------------------------------|
| CE   | Army Corps of Engineers<br><a href="http://www.usace.army.mil">www.usace.army.mil</a>        |                                  |
| CPSC | Consumer Product Safety Commission<br><a href="http://www.cpsc.gov">www.cpsc.gov</a>         | (800) 638-2772<br>(301) 504-7923 |
| DOC  | Department of Commerce<br><a href="http://www.commerce.gov">www.commerce.gov</a>             | (202) 482-2000                   |
| DOD  | Department of Defense<br><a href="http://dodssp.daps.dla.mil">http://dodssp.daps.dla.mil</a> | (215) 697-6257                   |
| DOE  | Department of Energy<br><a href="http://www.energy.gov">www.energy.gov</a>                   | (202) 586-9220                   |
| EPA  | Environmental Protection Agency<br><a href="http://www.epa.gov">www.epa.gov</a>              | (202) 272-0167                   |
| FAA  | Federal Aviation Administration<br><a href="http://www.faa.gov">www.faa.gov</a>              | (866) 835-5322                   |
| FCC  | Federal Communications Commission<br><a href="http://www.fcc.gov">www.fcc.gov</a>            | (888) 225-5322                   |
| FDA  | Food and Drug Administration<br><a href="http://www.fda.gov">www.fda.gov</a>                 | (888) 463-6332                   |
| GSA  | General Services Administration<br><a href="http://www.gsa.gov">www.gsa.gov</a>              | (800) 488-3111                   |
| HUD  | Department of Housing and Urban Development<br><a href="http://www.hud.gov">www.hud.gov</a>  | (202) 708-1112                   |
| LBL  | Lawrence Berkeley National Laboratory<br><a href="http://www.lbl.gov">www.lbl.gov</a>        | (510) 486-4000                   |



|       |   |                                  |
|-------|---|----------------------------------|
| NCHRP | National Cooperative Highway Research Program<br>(See TRB)  |                                  |
| NIST  | National Institute of Standards and Technology<br><a href="http://www.nist.gov">www.nist.gov</a>              | (301) 975-6478                   |
| OSHA  | Occupational Safety & Health Administration<br><a href="http://www.osha.gov">www.osha.gov</a>                 | (800) 321-6742<br>(202) 693-1999 |
| PBS   | Public Building Service<br>(See GSA)  |                                  |
| PHS   | Office of Public Health and Science<br><a href="http://www.osophs.dhhs.gov/ophs">www.osophs.dhhs.gov/ophs</a> | (202) 690-7694                   |
| RUS   | Rural Utilities Service<br>(See USDA)   | (202) 720-9540                   |
| SD    | State Department<br><a href="http://www.state.gov">www.state.gov</a>  | (202) 647-4000                   |
| TRB   | Transportation Research Board<br><a href="http://gulliver.trb.org">http://gulliver.trb.org</a>                | (202) 334-2934                   |
| USDA  | Department of Agriculture<br><a href="http://www.usda.gov">www.usda.gov</a>                                   | (202) 720-2791                   |
| USPS  | Postal Service<br><a href="http://www.usps.com">www.usps.com</a>  | (202) 268-2000                   |

#### 1.8 STATE GOVERNMENT CODES AND REGULATIONS:

- A. The Massachusetts State Building Code (780 CMR).
- B. The Fire Prevention Code (527 CMR).
- C. The Elevator Code (524 CMR).
- D. The Architectural Access Regulations (521 CMR).
- E. The Plumbing and Gas Code (248 CMR). and
- F. The Electrical Code (527 CMR).

#### 1.9 INDUSTRY STANDARDS

- A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
  - B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.
  - C. Conflicting Requirements: Where compliance with two (2) or more standards is specified and where the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different but apparently equal and other uncertainties to the Architect through the Owner's Project Manager for a decision before proceeding.
  - D. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.
- 
- 1.10 Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 1.11 Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.
  - 1.12 Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the Text provision. Refer to the "Encyclopedia of Associations", published by Gale Research Co., available in most libraries.
  - 1.13 Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in Contract Documents, are defined to mean the associated names. Names and addresses

are subject to change and are believed, but not ensured, to be accurate and up to date as of the date of Contract Documents.

AA Aluminum Association  
900 19th St., NW, Suite 300  
Washington, DC 20006 (202) 862-5100

AABC Associated Air Balance Council  
1518 K St., NW  
Washington, DC 20005 (202) 737-0202

AAMA American Architectural Manufacturers Association  
1540 E. Dundee Road, Suite 310  
Palatine, IL 60067 (708) 202-1350

AASHTO American Association of State Highway  
and Transportation Officials  
444 North Capitol St., Suite 225  
Washington, DC 20001 (202) 624-5800

AATCC American Association of Textile Chemists  
and Colorists  
P.O. Box 12215  
Research Triangle Park, NC (919) 549-8141

ACI American Concrete Institute  
P.O. Box 19150  
Detroit, MI 48219 (313) 532-2600

ACIL American Council of Independent Laboratories  
1629 K St., NW  
Washington, DC 20006 (202) 887-5872

ACPA American Concrete Pipe Association  
8300 Boone Blvd., Suite 400  
Vienna, VA 22182 (703) 821-1990

ADC Air Diffusion Council  
One Illinois Center, Suite 200  
111 East Wacker Drive  
Chicago, IL 60601-4298 (312) 616-0800

AFBMA Anti-Friction Bearing Manufacturers Association  
1101 Connecticut Ave., NW, Suite 700  
Washington, DC 20036 (202) 429-5155

AGA American Gas Association

1515 Wilson Blvd.  
Arlington, VA 22209 (703) 841-8400

AHA American Hardboard Association  
520 North Hicks Road  
Palatine, IL 60067 (708) 934-8800

AHAM Association of Home Appliance Manufacturers  
20 North Wacker Drive  
Chicago, IL 60606 (312) 984-5800

AI Asphalt Institute  
Research Park Drive  
P.O. Box 14052  
Lexington, KY 40512-4052 (606) 288-4960

AIA American Institute of Architects  
1735 New York Ave., NW  
Washington, DC 20006 (202) 626-7300

A.I.A. American Insurance Association  
1130 Connecticut Ave., NW, Suite 1000  
Washington, DC 20036 (202) 828-7100

AIHA American Industrial Hygiene Association  
P.O. Box 8390  
345 White Pond Drive  
Akron, OH 44320 (216) 873-2442

AISC American Institute of Steel Construction  
One East Wacker Drive, Suite 3100  
Chicago, IL 60601-2001 (312) 670-2400

AITC American Institute of Timber Construction  
11818 SE Mill Plain Blvd., Suite 415  
Vancouver, WA 98684 (206) 254-9132

ALI Associated Laboratories, Inc.  
500 South Vermont Street  
Palatine, IL 60067 (708) 358-7400

ALSC American Lumber Standards Committee  
P.O. Box 210  
Germantown, MD 20875 (301) 972-1700

AMCA Air Movement and Control Association

30 W. University Drive  
Arlington Heights, IL 60004-1893 (708) 394-0150

ANSI American National Standards Institute  
11 West 42nd Street, 13th Floor  
New York, NY 10036 (212) 642-4900

AOAC Association of Official Analytical Chemists  
2200 Wilson Blvd., Suite 400  
Arlington, VA 22201-3301 (703) 522-3032

AOSA Association of Official Seed Analysts  
c/o Larry J. Prentice  
268 Plant Science 1ANR-UNL, Box 19281  
Lincoln, NE 68583-0911 (402) 472-8649

APA American Plywood Association  
P.O. Box 11700  
Tacoma, WA 98411 (206) 565-6600

API American Petroleum Institute  
1220 L St., NW  
Washington, DC 20005 (202) 682-8000

ARI Air Conditioning and Refrigeration Institute  
1501 Wilson Blvd., 6th Floor  
Arlington, VA 22209 (703) 524-8800

ARMA Asphalt Roofing Manufacturers Association  
6288 Montrose Rd.  
Rockville, MD 20852 (301) 231-9050

ASA Acoustical Society of America  
500 Sunnyside Blvd.  
Woodbury, NY 11797 (516) 349-7800

ASC Adhesive and Sealant Council  
1627 K Street, NW, Suite 1000  
Washington, DC 20006-1707 (202) 452-1500

ASHRAE American Society of Heating, Refrigerating  
and Air-Conditioning Engineers  
1791 Tullie Circle, NE  
Atlanta, GA 30329 (404) 636-8400

ASME American Society of Mechanical Engineers

345 East 47th St.  
New York, NY 10017 (212) 705-7722

ASPE American Society of Plumbing Engineers  
3617 Thousand Oaks Blvd., Suite 210  
Westlake, CA 91362 (805) 495-7120

ASSE American Society of Sanitary Engineering  
P.O. Box 40362  
Bay Village, OH 44140 (216) 835-3040

ASTM American Society for Testing and Materials  
1916 Race St.  
Philadelphia, PA 19103-1187 (215) 977-9679

ATIS Alliance for Telecommunications  
Industry Solutions (202) 628-6380  
1200 G Street, NW, Suite 500  
Washington, DC 20005

AWCMA American Window Covering Manufacturers Association  
355 Lexington Avenue  
New York, NY 10017 (212) 661-4261

AWI Architectural Woodwork Institute  
P.O. Box 1550  
13924 Braddock Rd., Suite 100  
Centreville, VA 22020 (703) 222-1100

AWPA American Wood Preservers' Association  
4128-1/2 California Ave. SW, No. 171  
Seattle, WA 98116 (206) 937-5338

AWPB American Wood Preservers Bureau  
4 E. Washington Street  
Newnan, GA 30263 (404) 254-9877

AWS American Welding Society  
550 LeJeune Road, NW  
P.O. Box 351040  
Miami, FL 33135 (305) 443-9353

AWWA American Water Works Association  
6666 West Quincy Avenue  
Denver, CO 80235 (303) 794-7711

BHMA Builders' Hardware Manufacturers Association  
355 Lexington Ave., 17th Floor  
New York, NY 10017 (212) 661-4261

BIA Brick Institute of America  
11490 Commerce Park Drive  
Reston, VA 22091 (703) 620-0010

BIFMA Business and Institutional Furniture Manufacturers Assoc.  
2335 Burton Street, SE  
Grand Rapids, MI 49506 (616) 243-1681

CAGI Compressed Air and Gas Institute  
c/o John H. Addington  
Thomas Associates, Inc.  
1300 Sumner Avenue  
Cleveland, OH 44115-2851 (216) 241-7333

CAUS Color Association of the United States  
409 West 44th Street  
New York, NY 10036 (212) 582-6884

CBM Certified Ballast Manufacturers Association  
Hanna Building, No. 772  
1422 Euclid Avenue  
Cleveland, OH 44115-2851 (216) 241-0711

CCC Carpet Cushion Council  
P.O. Box 546  
Riverside, CT 06878 (203) 637-1312

CDA Copper Development Association  
2 Greenwich Office Park, Box 1840  
Greenwich, CT 06836 (203) 625-8210

CFFA Chemical Fabrics & Film Association, Inc.  
c/o Thomas Associates, Inc.  
1300 Sumner Avenue  
Cleveland, OH 44115-2851 (216) 241-7333

CGA Compressed Gas Association  
1725 Jefferson Davis Highway, Suite 1004  
Arlington, VA 22202-4100 (703) 979-0900

CISCA Ceiling and Interior Systems Construction Association  
5700 Old Orchard Road, 1st Floor

Skokie, IL 60077 (708) 965-2776

CISPI Cast Iron Soil Pipe Institute  
5959 Shallowford Road, Suite 419  
Chattanooga, TN 37421 (615) 892-0137

CRI Carpet and Rug Institute  
P.O. Box 2048  
Dalton, GA 30722 (404) 278-3176

CRSI Concrete Reinforcing Steel Institute  
933 Plum Grove Road  
Schaumburg, IL 60173 (708) 517-1200

DHI Door and Hardware Institute  
14170 New Brook Drive  
Chantilly, VA 22022 (703) 222-2010

DIPRA Ductile Iron Pipe Research Association  
245 Riverchase Parkway East, Suite O  
Birmingham, AL 35244 (205) 988-9870

DLPA Decorative Laminate Products Association  
600 South Federal Street, Suite 400  
Chicago, IL 60605 (312) 922-6222

ECSA Exchange Carriers Standards Association  
5430 Grosvenor Lane, Suite 200  
Bethesda, MD 20814 (301) 564-4505

EIA Electronic Industries Association  
2001 Pennsylvania Avenue, NW  
Washington, DC 20006-1813 (202) 457-4900

EIMA Exterior Insulation Manufacturers Association  
2759 State Road 580, Suite 112  
Clearwater, FL 34621 (813) 726-6477

EJMA Expansion Joint Manufacturers Association  
25 North Broadway  
Tarrytown, NY 10591 (914) 332-0040

ETL ETL Testing Laboratories, Inc.  
P.O. Box 2040  
Route 11, Industrial Park  
Cortland, NY 13045 (607) 753-6711



FCI Fluid Controls Institute  
P.O. Box 9036  
Morristown, NJ 07960 (201) 829-0990

FCIB Floor Covering Installation Board  
310 Holiday Avenue  
Dalton, GA 30720 (706) 226-5488

FGMA Flat Glass Marketing Association  
White Lakes Professional Building  
3310 Southwest Harrison  
Topeka, KS 66611-2279 (913) 266-7013

FM Factory Mutual Research Organization  
1151 Boston-Providence Turnpike  
P.O. Box 9102  
Norwood, MA 02062 (617) 762-4300

GA Gypsum Association  
810 First Street, NE, Suite 510  
Washington, DC 20002 (202) 289-5440

HEI Heat Exchange Institute  
c/o John H. Addington  
Thomas Associates, Inc.  
1300 Sumner Avenue  
Cleveland, OH 44115-2851 (216) 241-7333

HI Hydronics Institute  
P.O. Box 218  
35 Russo Place  
Berkeley Heights, NJ 07922 (908) 464-8200

H.I. Hydraulic Institute  
30200 Detroit Road  
Cleveland, OH 44145-1967 (216) 899-0010

HMA Hardwood Manufacturers Assoc.  
400 Penn Center Blvd.  
Pittsburgh, PA 15235 (412) 829-0770

HPMA Hardwood Plywood Manufacturers Assoc.  
1825 Michael Farraday Drive  
P.O. Box 2789  
Reston, VA 22090-2789 (703) 435-2900

IBD     Institute of Business Designers  
341 Merchandise Mart  
Chicago, IL 60654                      (312) 647-1950

ICEA     Insulated Cable Engineers Association, Inc.  
P.O. Box 440  
South Yarmouth, MA 02664              (508) 394-4424

IEC     International Electrotechnical Commission  
(Available from ANSI)  
1430 Broadway  
New York, NY 10018                      (212) 354-3300

IEEE     Institute of Electrical and Electronic Engineers  
345 East 47th Street  
New York, NY 10017                      (212) 705-7900

IESNA Illuminating Engineering Society of North America  
345 East 47th Street  
New York, NY 10017                      (212) 705-7926

IGCC     Insulating Glass Certification Council  
c/o ETL Testing Laboratories, Inc.  
P.O. Box 2040  
Route 11, Industrial Park  
Cortland, NY 13045                      (607) 753-6711

IMSA     International Municipal Signal Association  
165 East Union Street  
P.O. Box 539  
Newark, NY 14513                      (315) 331-2182

IRI     Industrial Risk Insurers  
85 Woodland Street  
Hartford, CT 06102                      (203) 520-7300

ISA     Instrument Society of America  
P.O. Box 12277  
67 Alexander Drive  
Research Triangle Park, NC 27709              (919) 549-8411

KCMA Kitchen Cabinet Manufacturers Association  
1899 Preston White Drive  
Reston, VA 22091-4326                      (703) 264-1690

LIA     Lead Industries Association, Inc.

295 Madison Avenue  
New York, NY 10017 (212) 578-4750

LPI Lightning Protection Institute  
3365 North Arlington Heights Road, Suite J  
Arlington Heights, IL 60004 (708) 255-3003

MCAA Mechanical Contractors Association of America  
1385 Piccard Drive  
Rockville, MD 20850-4329 (301) 869-5800

ML/SFA Metal Lath/Steel Framing Association  
(A Division of the National Association  
of Architectural Metal Manufacturers)  
600 South Federal Street, Suite 400  
Chicago, IL 60605 (312) 922-6222

MSS Manufacturers Standardization Society of  
the Valve and Fittings Industry  
127 Park Street, NE  
Vienna, VA 22180 (703) 281-6613

NAAMM National Association of Architectural  
Metal Manufacturers  
600 South Federal Street, Suite 400  
Chicago, IL 60605 (312) 922-6222

NAIMA North American Insulation Manufacturers Association  
44 Canal Center Plaza, Suite 310  
Alexandria, VA 22314 (703) 684-0084

NBHA National Builders Hardware Association  
(Now DHI)

NCMA National Concrete Masonry Association  
P.O. Box 781  
Herndon, VA 22070-0781 (703) 435-4900

NCRPM National Council on Radiation Protection  
and Measurements  
7910 Woodmont Avenue, Suite 800  
Bethesda, MD 20814 (301) 657-2652

NCSPANational Corrugated Steel Pipe Association  
2011 Eye Street, NW  
Washington, DC 20006 (202) 223-2217

NEC National Electrical Code (from NFPA)

NECA National Electrical Contractors Association  
7315 Wisconsin Avenue  
Bethesda, MD 20814 (301) 657-3110

NEMA National Electrical Manufacturers Association  
2101 L Street, NW, Suite 300  
Washington, DC 20037 (202) 457-8400

NETA International Electrical Testing Association  
P.O. Box 687  
Morrison, CO 80465 (303) 467-0526

NFPA National Fire Protection Association  
One Batterymarch Park  
P.O. Box 9101  
Quincy, MA 02269-9101 (617) 770-3000  
(800) 344-3555

N.F.P.A. National Forest Products Association  
1250 Connecticut Avenue, NW, Suite 200  
Washington, DC 20036 (202) 463-2700

NHLA National Hardwood Lumber Association  
P.O. Box 34518  
Memphis, TN 38184-0518 (901) 377-1818

NKCA National Kitchen Cabinet Association  
(Now KCMA)

NLGA National Lumber Grades Authority  
1055 West Hastings Street, Suite 260  
Vancouver, British Columbia  
Canada V6E 2E9 (604) 687-2171

NOFMA National Oak Flooring Manufacturers Association  
P.O. Box 3009  
Memphis, TN 38173-0009 (901) 526-5016

NPA National Particleboard Association  
18928 Premiere Court  
Gaithersburg, MD 20879 (301) 670-0604

NPCA National Paint and Coatings Association  
1500 Rhode Island Avenue, NW

Washington, DC 20005 (202) 462-6272

NRCA National Roofing Contractors Association  
10255 West Higgins Road, Suite 600  
Rosemont, IL 60018-5607 (708) 299-9070

NSF National Sanitation Foundation  
3475 Plymouth Road  
P.O. Box 1468  
Ann Arbor, MI 48106 (313) 769-8010

NWMA National Woodwork Manufacturers Association  
(Now NWWDA)

NWWDA National Wood Window and Door Association  
1400 East Touhy Avenue, #G54  
Des Plaines, IL 60018 (708) 299-5200

PCA Portland Cement Association  
5420 Old Orchard Road  
Skokie, IL 60077 (708) 966-6200

PCI Precast/Prestressed Concrete Institute  
175 West Jackson Blvd.  
Chicago, IL 60604 (312) 786-0300

PDI Plumbing and Drainage Institute  
c/o Sol Baker  
1106 West 77th Street, South Drive  
Indianapolis, IN 46260 (317) 251-6970

PEI Porcelain Enamel Institute  
1101 Connecticut Avenue, NW, Suite 700  
Washington, DC 20036 (202) 857-1134

RFCI Resilient Floor Covering Institute  
966 Hungerford Drive, Suite 12-B  
Rockville, MD 20805 (301) 340-8580

RIS Redwood Inspection Service  
405 Enfrente Drive, Suite 200  
Novato, CA 94949 (415) 382-0662

RMA Rubber Manufacturers Association  
1400 K Street, NW  
Washington DC 20005 (202) 682-4800

SDI     Steel Deck Institute  
P.O. Box 9506  
Canton, OH 44711                      (216) 493-7886

S.D.I.     Steel Door Institute  
30200 Detroit Road  
Cleveland, OH 44145                      (216) 889-0010

SGCC     Safety Glazing Certification Council  
c/o ETL Testing Laboratories  
Route 11, Industrial Park  
Cortland, NY 13045                      (607) 753-6711

SHLMA     Southern Hardwood Lumber Manufacturers Association  
(Now HMA)

SIGMA Sealed Insulating Glass Manufacturers Association  
401 North Michigan Avenue  
Chicago, IL 60611                      (312) 644-6610

SMA     Screen Manufacturers Association  
3950 Lake Shore Drive, Suite 502-A  
Chicago, IL 60613-3431                      (312) 525-2644

SMACNA Sheet Metal and Air Conditioning  
Contractors National Association  
4201 Lafayette Center Drive  
Chantilly, VA 22021                      (703) 803-2980

SPIB     Southern Pine Inspection Bureau  
4709 Scenic Highway  
Pensacola, FL 32504                      (904) 434-2611

SPRI     Single Ply Roofing Institute  
20 Walnut Street  
Wellesley Hills, MA 02189                      (617) 237-7879

SSPC     Steel Structures Painting Council  
4400 Fifth Avenue  
Pittsburgh, PA 15213-2683                      (412) 268-3327

SSPMA Sump and Sewage Pump Manufacturers Association  
P.O. Box 298  
Winnetka, IL 60093                      (708) 835-8911

SWI        Steel Window Institute  
c/o Thomas Associates, Inc.  
1300 Sumner Ave,  
Cleveland, OH 44115-2851        (216) 241-7333

SWPA      Submersible Wastewater Pump Association  
600 South Federal Street, Suite 400  
Chicago, IL 60605        (312) 922-6222

TIMA      Thermal Insulation Manufacturers Association  
29 Bank Street  
Stamford, CT 06901        (203) 324-7533  
(Standards now issued by NAIMA)

TPI        Truss Plate Institute  
583 D'Onofrio Drive, Suite 200  
Madison, WI 53719        (608) 833-5900

UFAC      Upholstered Furniture Action Council  
Box 2436  
High Point, NC 27261        (919) 885-5065

UL        Underwriters Laboratories, Inc.  
333 Pfingsten Road  
Northbrook, IL 60062        (708) 272-8800

USP        U.S. Pharmacopoeial Convention  
12601 Twinbrook Parkway  
Rockville, MD 20852        (301) 881-0666

WCLIB West Coast Lumber Inspection Bureau  
P.O. Box 23145  
Portland, OR 97223        (503) 639-0651

WCMA Wallcovering Manufacturers Association  
355 Lexington Avenue, 17th Floor  
New York, NY 10017        (212) 661-4261  
(WCMA has moved from this location, perhaps to  
the Chicago area. Address and telephone  
number not confirmed.)

WIC        Woodwork Institute of California  
P.O. Box 11428  
Fresno, CA 93773-1428        (209) 233-9035

WRI        Wire Reinforcement Institute

1101 Connecticut Avenue NW, Suite 700  
Washington, DC 20036-4303 (202) 429-5125

WSC Water Systems Council  
600 South Federal Street, Suite 400  
Chicago, IL 60605 (312) 922-6222

WSFI Wood and Synthetic Flooring Institute  
4415 West Harrison Street, Suite 242-C  
Hillside, IL 60162 (708) 449-2933

WLPDIA Western Lath, Plaster, Drywall Industries Association  
(Formerly California Lath & Plaster Association)  
8635 Navajo Road  
San Diego, CA 92119 (619) 466-9070

WWPA Western Wood Products Association  
Yeon Building  
522 SW 5th Avenue  
Portland, OR 97204-2122 (503) 224-3930

W.W.P.A. Woven Wire Products Association  
2515 North Nordica Avenue  
Chicago, IL 60635 (312) 637-1359

#### 1.14 GOVERNING REGULATIONS AND AUTHORITIES

- A. Copies of Regulations: Obtain copies of governing regulations and retain at the Project site to be available for reference by parties who have a reasonable need, if requested by the Architect.

#### 1.15 SUBMITTALS

- A. Permits, Licenses, and Certificates: For the Owner's records, submit through the Owner's Project Manager copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

### PART 2 - PRODUCTS (Not Used)



**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 014200**



Section 01 43 39  
MOCK-UPS

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Mockup requirements. Mock-ups are required for, but not limited to the following:
  - 1. On-site exterior wall section sample panel. Mock up panel; will be subject to testing under Section 01 45 29 – TESTING LABORATORY SERVICES.
  - 2. Typical classroom mock-up.
  - 3. Additional site mock-ups as specified in individual sections.
- B. All mock-ups specified herein, under other Sections of the Specifications, and shown on drawings will be reviewed and approved by the Architect and Owner. Unaccepted mock-ups shall be replaced or reconstructed in part or in total and the extent of the replacement or reconstruction shall be at the discretion of the Architect and Owner. The Construction Manager shall carry forth mock-up replacement or reconstruction until Architect's acceptance is obtained. Mock-up costs, including as many replacements or reconstruction as necessary to gain Architect's acceptance, shall be included in the Contract Cost and Schedule.

1.2 RELATED REQUIREMENTS

- A. Section 01 81 13 - SUSTAINABLE DESIGN REQUIREMENTS: Special administrative and procedure requirements related to the Owner's *LEED v4, LEED for Building Design and Construction, LEED BD+C: Schools* rating system certificate goals of energy conservation and efficiency, indoor air quality, and natural resource efficiency.
- B. Section 01 60 00 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
- C. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
- D. Section 01 45 00 - QUALITY CONTROL.
- E. Section 01 45 29 – TESTING LABORATORY SERVICES.
- F. Section 01 91 13 –COMMISSIONING REQUIREMENTS.
- G. Section 03 30 00 - CAST-IN-PLACE CONCRETE.
- H. Section 04 20 00 - UNIT MASONRY.
- I. Section 05 12 00 – STRUCTURAL STEEL.
- J. Section 05 40 00 - COLD-FORMED METAL FRAMING.
- K. Section 05 50 00 – METAL FABRICATIONS.
- L. Section 06 16 00 - SHEATHING.
- M. Section 07 21 00 - THERMAL INSULATION.

- N. Section 07 27 13 - MEMBRANE AIR BARRIERS.
- O. Section 07 42 43 - COMPOSITE WALL PANELS.
- P. Section 07 54 19 - POLYVINYL CHLORIDE (PVC) ROOFING
- Q. Section 07 62 00 - SHEET METAL FLASHING AND TRIM.
- R. Section 07 92 00 - JOINT SEALERS.
- S. Section 08 43 13 - ALUMINUM-FRAMED STOREFRONTS.
- T. Section 08 44 13 - GLAZED ALUMINUM CURTAIN WALLS
- U. Section 08 51 13 - ALUMINUM WINDOWS.

### 1.3 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 00 - SUBMITTAL PROCEDURES:
  - 1. Submit shop drawing of mockup indicating sizes, finishes and method of construction and installation of each component

### 1.4 GENERAL

- A. Where requested by Architect, or as specified in individual specification sections, assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes. Remove mock-up assemblies prior to date of Final Inspection, or as directed.
- B. Mock-ups, when approved by the Architect, will be used as datum for comparison with the remainder of the Work for the purposes of acceptance or rejection. Maintain mockup throughout construction period until Substantial Completion or as otherwise directed by Architect.
  - 1. Finishes, colors and textures of components shall be as specified for each component and shall be selected by the Architect.
- C. Demolish and remove from site prior to requesting inspection for certification of Substantial Completion, all Mock-ups which are not permitted to remain as part of the finished work.

### 1.5 COORDINATION

- A. Coordinate work of trades and schedule elements to expedite the fabricating, furnishing, and installation of multiple component mock-ups specified herein, in other Sections of the Specifications, and as shown in the Contract Documents.

## PART 2 - PRODUCTS

### 2.1 EXTERIOR WALL SECTION MOCK-UP

- A. Mockup Unit: Shall consist of one full size facsimile exterior wall section, using specified products as noted below. Mock-up shall be size and configuration as indicated on the Drawings.

- 
1. General description: Mockup unit shall include exterior masonry construction, with light gage steel stud framing backup and sheathing assembly as well as concrete masonry unit backup. Mockup shall include all components specified and indicated which are typical to the exterior wall construction and additional components specified herein.
    - a. Fabricate mockup unit with face brick and metal backup panel as specified, with selected mortar and backup consisting of 8 inch metal studs, insulated metal wall panel backup with specified brick anchors.
      - 1) Provide additional metal stud framing and cross bracing required for construction of various components of the mockup panel.
      - 2) Provide concealed various wood blocking, edgings, nailers, curbs, and cants required for receipt of various finishes and surfacing materials.
    - b. Fabricate aluminum window unit with glazing.
    - c. Include into mockup assembly all flashing, joint sealers, and all finish trim and accessories necessary to show typical completed construction.
    - d. Mock up shall include typical roof construction and all associated components.
  2. Finishes, colors and textures of components shall be as specified for each component and shall be selected by the Architect.
    - a. Provide window unit with specified insulated glazing.
- B. Components to be included in the mockup include, but are not limited to:
1. Section 03 30 00 - CAST-IN-PLACE CONCRETE.
    - a. Provide a concrete foundation wall to a depth required to support wall mockup.
  2. Section 04 20 00 - UNIT MASONRY.
    - a. Provide type of brick and colored mortar specified, installed over insulated metal wall panel backup with specified anchorage devices.
    - b. Provide face brick in bond pattern, mortar color, and joint type to be used in the Work.
  3. Section 05 12 00 – STRUCTURAL STEEL.
    - a. Support framing and typical building framing for mock-up conditions.
  4. Section 05 40 00 - COLD-FORMED METAL FRAMING:
    - a. Provide cold formed metal stud framing with bracing for construction and support of the mockup panel.
  5. Section 05 50 00 – METAL FABRICATIONS.
    - a. Provide galvanized steel lintels for openings in the mockup panel.
  6. Section 06 16 00 - SHEATHING:
    - a. Install sheathing board, on both sides of metal stud framing, with taped joints and metal and membrane flashing.
  7. Section 07 21 00 - THERMAL INSULATION:
    - a. Provide mineral wool insulation over sheathing and masonry backup.
  8. Section 07 27 13 - MEMBRANE AIR BARRIERS:
-

- 
- a. Provide air barrier over sheathing and masonry back-up including typical flashing conditions and transitional tie-ins to windows, storefront and curtain wall.
  9. Section 07 42 43 –COMPOSITE WALL PANELS:
    - a. Install composite wall panel over metal stud framing, with membrane flashing.
  10. Section 07 54 19 - POLYVINYL CHLORIDE (PVC) ROOFING:
    - a. Provide standard roof construction with interfacing conditions at masonry wall construction including roof edge.
  11. Section 07 62 00 - SHEET METAL FLASHING AND TRIM:
    - a. Provide typical metal flashing built into masonry construction.
  12. Section 07 92 00 - JOINT SEALERS:
    - a. Provide joint sealant at perimeter of all components. Colors shall be selected by the Architect.
  13. Section 08 43 13 - ALUMINUM-FRAMED STOREFRONTS: Provide fixed glass type storefront assembly and door, matching indicated profiles and dimensions exactly.
    - a. Fabricate with removable stop for installation of glass.
    - b. Storefront to be enamel shop finished to match selected PVDF finish specified for aluminum windows, matching color and sheen.
    - c. Mock-up shall pass testing requirements specified in Section 01 45 29 – TESTING LABORATORY SERVICES before the Metal Window Trade Contractor shall be allowed to proceed with the work.
  14. Section 08 44 13 - GLAZED ALUMINUM CURTAIN WALLS: Provide aluminum curtain wall matching indicated profiles and dimensions exactly.
    - a. Fabricate with removable stop for installation of glass.
    - b. Curtain wall to be enamel shop finished to match selected PVDF finish specified for aluminum windows, matching color and sheen.
    - c. Mock-up shall pass testing requirements specified in Section 01 45 29 – TESTING LABORATORY SERVICES before the Metal Window Trade Contractor shall be allowed to proceed with the work.
  15. Section 08 51 13 - ALUMINUM WINDOWS: Provide fixed glass type aluminum windows, matching indicated window unit profiles and dimensions exactly.
    - a. Fabricate with removable stop for installation of glass.
    - b. Window to be enamel shop finished to match selected PVDF finish specified for aluminum windows, matching color and sheen.
    - c. Provide specified insulated glass into windows, storefront and curtain wall.
    - d. Mock-up shall pass testing requirements specified in Section 01 45 29 – TESTING LABORATORY SERVICES before the Metal Window Trade Contractor shall be allowed to proceed with the work.
-

2.2 TYPICAL CLASSROOM MOCK-UP

- A. Mockup Unit: Shall consist of one entire classroom with all materials, finishes and appurtenances in place including building systems. Mock-up shall be size and configuration as indicated on the Drawings.

**PART 3 - EXECUTION**

3.1 PREPARATION

- A. Construct mock-ups at locations indicated or, if not indicated, at locations directed by the Architect.
- B. Construct mockup in time to make product and/or assembly modifications without delaying production work.
- C. Construction of components on building correlating with mock-up wall shall not commence until mock-up wall has been fully accepted by Owner and Architect.

3.2 INSTALLATION

- A. Construct mockup to duplicate actual job conditions.
  - 1. Locate at an area on site as directed by the Architect.
  - 2. Provide foundations, bases, supports and braces adequate to make mockup stable and safe.
- B. Provide weather protection for materials in mockups that are not exposed to weather in intended service.

3.3 REMOVAL

- A. Retain mock-ups during construction as a standard for judging completed work until time designated by the Architect and the Owner,
  - 1. Completely demolish and remove mockups from the job site at time designated by Architect.
  - 2. Accepted mock-ups (which are specifically identified by the Architect to become part of the work) may be incorporated into the work provided they are not damaged during subsequent construction.

End of Section

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Section 01 45 29  
TESTING LABORATORY SERVICES

**PART 1 - GENERAL**

1.1 SUMMARY

- A. This Section consists of the following:
  - 1. Quality assurance.
  - 2. Laboratory responsibilities.
  - 3. Laboratory reports.
  - 4. Limits on testing laboratory authority.
  - 5. Construction Manager responsibilities.
  - 6. Construction Manager submittals.
  - 7. Schedule of inspections and tests.
  - 8. Concrete in situ relative humidity, calcium chloride and acidity/alkalinity testing.

1.2 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. ANSI/ASTM D 3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock
  - 2. ANSI/ASTM E 329 - Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
  - 3. ASTM F 1869 – Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
  - 4. ASTM F 2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In-Situ Probes
  - 5. ASTM F 710 – Standard Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.

1.3 QUALITY ASSURANCE

- A. Comply with requirements of ANSI/ASTM D 3740 and ANSI/ASTM E 329.
- B. Laboratory: Authorized to operate in state in which Project is located.
- C. Laboratory staff: Maintain a full time specialist on staff to review services. Provide registered Engineer on staff for all review of services related to structural testing.
- D. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either the National Bureau of Standards (NBS) Standards or accepted values of natural physical constraints.

#### 1.4 LABORATORY RESPONSIBILITIES

- A. Cooperate with Architect and Construction Manager in performance of services; provide qualified personnel promptly on notice.
  - 1. Attend preconstruction conferences and progress meetings, as requested.
- B. Acquaint Owner's Project Manager, Architect, and Construction Manager's superintendent with testing procedures and with all special conditions encountered at the site.
- C. Perform specified Inspection, sampling, and testing of products and construction methods in accordance with specified standards as specified in individual technical specification sections:
  - 1. Comply with specified standards, ASTM, ANSI, and other recognized authorities.
  - 2. Conduct and interpret the tests and state in each report whether the test specimens comply with the requirements, and specifically state any deviations therefrom.
  - 3. Obtain Construction Manager's written acknowledgment of each inspection, sampling, and test made. Test samples of mixes submitted by Construction Manager.
  - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
- D. Promptly notify Architect and Construction Manager of irregularities, deficiencies, or non-conformance of Work or Products which are observed during performance of services.
- E. Promptly submit written report of each test and inspection with one copy each to Architect, Owner's Project Manager, Construction Manager, and one copy to Project Record Documents File.
- F. Perform additional inspections and tests required by Architect/Engineer.

#### 1.5 LABORATORY REPORTS

- A. After each test, promptly distribute directly from the testing laboratory, copies of laboratory report to:
  - 1. Owner's Project Manager.
  - 2. Architect's office.
  - 3. Consulting engineer's office.
  - 4. Construction Manager's office.
  - 5. Municipal Inspectional Services Department, if required.
- B. Include in report the following information:
  - 1. Date issued,
  - 2. Project title and number,
  - 3. Testing laboratory name, address, and telephone number.
  - 4. Name and signature of laboratory inspector.

5. Date and time of sampling,
6. Record of temperature and weather conditions (as appropriate to test).
7. Identification of product and Specifications Section,
8. Location of sample or test in the Project.
9. Type of inspection or test.
10. Results of tests and compliance with Contract Documents.
11. Interpretation of test results, when requested by Architect.
12. Observations regarding compliance with Contract Documents

#### 1.6 LIMITS ON TESTING LABORATORY AUTHORITY

- A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Laboratory may not approve or accept any portion of Work.
- C. Laboratory may not assume any duties for Construction Manager.
- D. Laboratory has no authority to stop the Work.

#### 1.7 CONSTRUCTION MANAGER RESPONSIBILITIES

- A. Coordinate and cooperate with laboratory personnel, provide access to Work, and to manufacturer's facilities.
  1. Monitor each inspection, sampling, and test.
  2. Provide Laboratory or Agency with written -acknowledgment of each Inspection, sampling, and test.
  3. Within 24 hours notify Architect and Owner in writing of reasons for not acknowledging Laboratory results.
- B. Secure and deliver to the Laboratory or designated location, adequate quantities of representational samples of materials proposed to be used and which require testing, along with proposed mix designs.
- C. Furnish incidental labor and facilities:
  1. To provide access to Work to be tested.
  2. To obtain and handle samples at the Project site or at the source of the Product to be tested.
  3. To facilitate inspections and tests.
  4. For storage and curing of test samples.
- D. Furnish verification of materials and equipment compliance with Contract Documents.
- E. Notify Architect and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.
- F. Identify materials to be tested or inspected by Testing Laboratory or Agency.

- G. After determination of need for testing or inspecting by Owner, notify Laboratory sufficiently in advance, minimum five days, of operations to allow for its assignment of personnel and scheduling of tests.
  - 1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Construction Managers negligence.
- H. Make arrangements with laboratory and pay for additional samples and tests required for the following conditions:
  - 1. Initial testing indicates Work does not comply with Contract Documents.
  - 2. Construction Manager requested testing for additional testing and laboratory services beyond specified requirements.

#### 1.8 CONDUCT OF INSPECTIONS AND TESTS

- A. The Construction Manager shall notify the Owner's Project Manager, Architect, and Testing Laboratory a minimum of 72 hours before the performance of work to permit the proper conduct of Owner authorized inspections and tests.
- B. Representatives of Testing Laboratory will inspect the manufacture, assembly, and placement of materials as required and as authorized by the Owner, and report their findings to the Architect, Owner's Project Manager, and Construction Manager.
- C. Work shall be checked as it progresses, but failure to detect any defective work or materials shall in no way prevent later rejection when such defect is discovered nor shall it obligate the Owner to accept such work.

#### 1.9 SCHEDULE OF TESTING AND LABORATORIES BY OWNER

- A. Except as otherwise specified, Owner will appoint, employ, and pay services of independent firm(s) to perform inspection and testing and other services specified herein, in individual specification Sections, and as additionally required by the Architect.
- B. Requirements for testing, observations, and inspections are described in individual specification sections; the schedule provided below is not intended to completely describe all of the inspection and testing Work required for this Contract, and is only furnished as a guide.
  - 1. Section 03 30 00 - Cast-in-Place Concrete: Concrete test cylinders
  - 2. Section 04 20 00 - Unit Masonry: One day per week observation of masonry installation. grout, mortar and prism testing.
    - a. Three cylinders tested for compressive strength at 10 days; ASTM C 91 test.
    - b. Obtain sample face brick units (minimum 4) and test for conformance to ASTM C 67.
  - 3. Section 05 12 00 - Structural Steel Framing: Testing of welds of field and shop fabricated components. Testing of bolting.
    - a. Bolt torque testing.
    - b. Welding X-ray and ultrasonic tests as specified.

- c. Coating thickness of primer coats.
  - 4. Section 05 31 00 - Steel Decking: Periodic inspection of steel decking installation prior to concrete placement.
  - 5. Section 07 92 00 - Joint Sealants: Chemical analysis; adhesive strength; compatibility with adjacent materials; elasticity.
  - 6. Section 09 91 00 - Painting: Chemical analysis; coating thickness
- C. Concrete slabs and floors: Relative Humidity, Moisture Vapor Emission and acidity/alkalinity (pH) Testing:
- 1. Owner will employ and pay for services of an independent testing laboratory to perform relative humidity, moisture vapor emission, and pH tests on concrete slabs as follows. The test shall be witnessed by the Construction Manager, flooring Trade Contractors, subcontractors and Owner's Project Manager.
    - a. Relative Humidity, Moisture Vapor Emission and pH Testing on all concrete slabs over-which a finished floor is to be installed. This includes, but is not limited to:
      - 1) Wood flooring of all types.
      - 2) Resilient flooring of all types.
      - 3) Resinous flooring and seamless flooring of all types.
      - 4) Carpet tile.
      - 5) Concrete sealers.
    - b. Perform moisture and pH tests on all concrete floors over-which stone flooring is to be applied.
  - 2. Requirements: As specified under Part 3 of this Section.
    - a. Submit 1 copy of test data to the installers of all flooring materials or coating materials scheduled to be installed.
    - b. Provide additional testing in the event test results indicate higher moisture content than recommended by the flooring material and coating material manufacturers for the installation of their products. Perform such additional testing, at no additional cost to the Owner, after procedures have been performed to reduce moisture content to ratings acceptable to the various flooring and coating manufacturers.
- D. Special Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
- 1. Testing agency will notify Architect, Owner's Project Manager, and Construction Manager promptly of irregularities and deficiencies observed in the Work during performance of its services.
  - 2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect, through Construction Manager, with copy to Owner's Project Manager and to authorities having jurisdiction.
  - 3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  - 4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

5. Testing agency will retest and re-inspect corrected work.

1.10 SCHEDULE OF TESTING AND LABORATORIES BY CONSTRUCTION MANAGER

- A. Construction Manager shall employ and pay for services of an approved independent testing laboratory to perform inspection and testing specified under this Article and as additionally in individual specification sections
  - 1. Submit to Architect/Engineer a minimum of three independent testing laboratories for each type of testing specified by individual specification sections and those required by the referenced applicable codes, regulations and standards.
  - 2. Employment of testing laboratory shall in no way relieve Construction Manager of obligation to perform work in accordance with requirements of Contract Documents.
- B. Earthwork: Lab tests to determine suitability of all fill materials shall be paid for by Construction Manager.
  - 1. Owner reserves the right to retain and pay for his own testing for checking purposes
- C. Concrete Paving and General Concrete Work: Concrete mix design testing shall be paid for by Construction Manager. Owner reserves the right to retain and pay for his own testing for checking purposes.
- D. Moisture content testing of interior and exterior wood prior to application of field painted coatings.
- E. Local Authority Inspections: The Construction Manager is also responsible for coordinating and cooperating with local requirements for inspections by local Authorities.
- F. Massachusetts Energy Code Witness Testing: The Construction Manager shall engage the services of Massachusetts registered professional mechanical and electrical engineers who shall perform witness testing of all HVAC, lighting and power distribution systems in accordance with the requirements of the Massachusetts Energy Code. The registered professional engineer shall prepare a final performance acceptance report in accordance with the code requirements and in a form acceptable to the local code official. The actual testing shall be performed by the Construction Manager, his designated Trade Contractors or authorized manufacturers' representatives. All costs associated with the testing, witnessing of the testing and preparation of reports shall be part of the base contract bid.

1.11 SCHEDULE OF TESTING AND LABORATORIES BY TRADE CONTRACTORS

- A. Respective Trade Contractor shall employ and pay for services of an approved independent testing laboratory to perform inspection and testing specified under this Article and as additionally in individual specification sections
  - 1. Submit to Architect a minimum of three independent testing laboratories for each type of testing specified by individual specification sections and those required by the referenced applicable codes, regulations and standards.

2. Employment of testing laboratory shall in no way relieve Construction Manager of obligations to perform work in accordance with requirements of Contract Documents.
- B. Aluminum framed storefront, glazed aluminum curtain wall and aluminum windows:
1. Testing shall be performed and paid for by the Metal Window Trade Contractor and witnessed by the Construction Manager, Owner's Project Manager and Commissioning Agent.
  2. Testing of mock-ups and installed work subject to the following requirements:
    - a. Independent inspection and testing agency engaged on the project shall be authorized by authorities having jurisdiction to operate in the Commonwealth of Massachusetts and as acceptable to the Owner, Construction Manager, Architect and Commissioning Agent.
      - 1) Testing agency will notify Architect, Construction Manager, Owner's Project Manager and Trade Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
      - 2) Testing agency will submit a certified written report of each test, inspection, and similar quality control service to Architect with copy to Construction Manager, Owner's Project Manager and Trade Contractor.
      - 3) Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
      - 4) Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
      - 5) Testing agency will retest and re-inspect corrected work.
    - b. In-place testing of specified limits of air infiltration and water resistance according to following:
      - 1) AAMA 501.1 - Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure.
      - 2) AAMA 502 -Voluntary Specification for Field Testing of Newly Installed Fenestration Products.
      - 3) ASTM E 783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
      - 4) ASTM E 1105 – Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
    - c. Failed tests will result in additional testing of the failed specimens and an additional specimen at the cost of the Trade Contractor. Testing will be concluded only when satisfactory results are achieved. Any required re-testing that is a result of deficient installation shall not be considered a justified reason for a claim of delay or for a time extension by the Construction Manager or Trade Contractor.
    - d. Schedule of testing:
      - 1) Mockup wall (refer to drawings):
        - a) Window with precast concrete head condition; qty. = 1

- b) Window with profiled metal panel head condition; qty. = 1
  - c) Curtain wall with composite metal panel head condition; qty. = 1
  - d) Storefront with precast head condition; qty. = 1
- 2) In-place building (actual locations to be selected by the architect):
  - a) Window with precast concrete head condition; qty. = 2
  - b) Window with profiled metal panel head condition; qty. = 2
  - c) Curtain wall with profiled metal panel head condition; qty. = 1
  - d) Curtain wall with composite metal panel head condition; qty. = 1
  - e) Storefront with profiled metal panel head condition; qty. = 1
  - f) Storefront with composite metal panel head condition; qty. = 1
  - g) Storefront with precast concrete head condition; qty. = 1
- C. Fire Protection System: At least the following tests shall be performed. Conform to requirements specified in individual Division 21 Specification Sections. The test shall be performed and paid for by the Trade Contractor and witnessed by the Construction Manager, Owner's Project Manager and authorities having jurisdiction:
  - 1. Fire protection system flushed and pressure tested.
- D. Plumbing: At least the following tests shall be performed. Conform to requirements specified in individual Division 22 Specification Sections. The test shall be performed and paid for by the Trade Contractor and witnessed by the Construction Manager, Owner's Project Manager and authorities having jurisdiction:
  - 1. Water supply piping hydrostatic pressure test.
  - 2. Sanitary piping test before fixture installation: Cap pipes and fill to highest point in system.
  - 3. Plumbing fixture operation.
- E. HVAC Testing: All HVAC work shall be tested by an independent testing and balancing agency, approved by Owner. Conform to requirements specified in individual Division 23 Specification Sections. The tests shall be performed and paid for by the Trade Contractor and witnessed by the Construction Manager, Owner's Project Manager and authorities having jurisdiction. Adjustments shall be made by the Trade Contractors directed by the Owner. At least the following tests shall be performed:
  - 1. Piping hydrostatic tests.
  - 2. Air and water balancing.
  - 3. Thermostat control monitoring and testing.
  - 4. Boiler efficiency testing.
  - 5. Energy Management System operation.
- F. Electrical Power System Testing: At least the following tests shall be performed. Conform to requirements specified in individual Division 26 Specification Sections. The tests shall be performed and paid for by the Trade Contractor and witnessed by the Construction Manager, Owner's Project Manager and authorities having jurisdiction:



1. Polarity tests.
  2. Operation of all circuits.
  3. Testing of emergency system.
  4. Security systems.
  5. Generation system.
  6. Grounding systems.
  7. Voice/Video/Data networking testing.
- G. Electrical Lighting System Testing: Conform to requirements specified in individual Division 26 Specification Sections. At least the following tests shall be performed and paid for by the Trade Contractor:
1. Operation of every component of entire system.
- H. Fire Alarm System Testing: At least the following tests will be performed. Conform to requirements specified in individual Division 26 Specification Sections. The test shall be performed and paid for by the Trade Contractor and witnessed by the Construction Manager, and Owner's Project Manager:
1. All smoke and heat detectors.
  2. Proper operation as required by authorities having jurisdiction.
- I. Where no testing requirements are described but the Owner or Architect/Engineer decides that testing is required, testing will be performed under current pertinent standards for testing.

#### 1.12 FOLLOW-UP AND CORRECTIVE ACTION

- A. The Construction Manager and the Owner will note the test record on the Testing Log to acknowledge test procedures and results. If follow-up or corrective action is needed, the Construction Manager shall submit to the Owner two written copies of proposed follow-up or corrective plans and obtain the Owner's written approval before proceeding.
1. Cost of Testing: If tests indicate that materials or work do not comply with requirements, the Construction Manager shall pay for all retesting, and shall remove and replace non-complying work at no additional cost to the Owner.

### **PART 2 - PRODUCTS (Not Used)**

### **PART 3 - EXECUTION**

#### 3.1 CONCRETE IN SITU RELATIVE HUMIDITY, CALCIUM CHLORIDE AND ACIDITY/ALKALINITY TESTING

- A. Scope:
1. Provide in situ concrete relative humidity and surface pH testing to all concrete slabs specified to be covered with floor coverings or resinous coatings. Includes concrete placed as part of this Work which occurs below grade, above grade (suspended slabs), and slabs on grade.
    - a. Existing building suspended slabs may be excluded from this requirement.

- B. Scheduling:
1. Testing shall take place after allowing concrete to dry for a minimum of 90 days. Testing to be scheduled no less than one, nor more than three weeks prior to scheduled flooring installation.
    - a. DO NOT conduct testing unless the slab environment is identical to that in which the finished flooring is to be installed.
  2. In the event new flooring is to be installed over existing resilient flooring, remove the portion of the existing flooring and adhesive directly under the area where testing will be conducted. Patch flooring to match existing construction after completion of testing.
- C. Test result submittals:
1. Report all test results in chart form listing test dates, time, depth of test well, in situ temperature, relative humidity, moisture vapor and pH levels.
  2. List test locations on chart and show same on marked up Floor Plan Drawings.
  3. Submit results in duplicate. Deliver copies directly to Architect, Owner's Project Representative and Construction Manager.
- D. Testing equipment: shall be equal to the following
1. For relative humidity testing:
    - a. Digital Meter and Calibrated Humidity and Temperature probe kit as manufactured by Vaisala Inc. (Boston Office) 10D Gill Street, Woburn, MA, 01801 (telephone 781-933-4500).
      - 1) Minimum 2 point probe calibration.
  2. For calcium chloride testing:
    - a. Anhydrous calcium chloride testing in accordance with Rubber Manufacturer's Association (RMA) Test requirements.
    - b. Test kits: Vaprecision, inc. 2941 West MacArthur Boulevard, Suite 135. Santa Ana, CA 92704 (telephone 800-449-6194).
  3. For pH testing:
    - a. pH test paper by Micro Essential Laboratory, Inc., P.O. Box 100824 4224 Avenue "H", Brooklyn, NY 11210, (telephone 718-338-3618).
    - b. Distilled or de ionized water.
- E. Testing Procedures Quantification of Relative Humidity
1. The test site should be maintained at the same temperature and humidity conditions as those anticipated during normal occupancy. These temperature and humidity levels should be maintained for 48 hours prior and during test period. If meeting this criteria is not possible, then minimum conditions should be 75 degrees F (plus or minus 10 degrees F), and 50 percent (plus or minus 10 percent) relative humidity. When a building is not under HVAC control, a recording hygrometer or data logger shall be in place recording conditions during the test period. A transcript of this information must be included with the test report.

2. The number of In situ relative humidity test sites is determined by the square footage of the facility. The minimum number of tests to be placed is equal to 3 in the first 1,000 square feet and 1 per each additional 1,000 square feet.
  3. Drill test holes utilizing a roto hammer drill. Hole diameter shall not exceed outside diameter of the insertable test sleeve by more than 0.04 inch. Drilling operation must be dry. Determine the thickness of the concrete slab from Construction Documents. Depths of test holes shall be as follows:
    - a. For elevated slabs (not poured in pans): Drill test holes to a depth equal to 20 percent of the concrete thickness.
    - b. For slabs on grade and elevated slabs in pans: Drill test holes to a depth equal to 40 percent of the concrete thickness.
  4. Vacuum all concrete dust from test hole.
  5. Insert a hole liner, or sleeve, to the full depth of test hole, assuring that the liner is capped or plugged at the end protruding from the concrete surface.
  6. Permit the test site to acclimate, or equilibrate, for 72 hours prior to taking relative humidity readings.
  7. Remove the sleeve plug and place a probe into the sleeve assuring that it reaches the bottom of the test hole.
  8. Allow the probe to sit in the test sleeve for 30 minutes before taking readings.
  9. Read and record temperature and relative humidity at the test site.
- F. Testing Procedures - Quantification of Concrete Moisture Vapor Emission through Calcium Chloride Testing.
1. The test site should be maintained at the same temperature and humidity conditions as those anticipated during normal occupancy. These temperature and humidity levels should be maintained for 48 hours prior and during test period. If meeting this criteria is not possible, then minimum conditions should be 75 degrees F (plus or minus 10 degrees F) and 50 percent relative humidity (plus or minus 10 percent). When a building is not under HVAC control, a recording hygrometer or data logger shall be in place recording conditions during the test period. A transcript of this information must be included with the test report.
  2. The number of vapor emission test sites is determined by the square footage of the facility. The minimum number of tests to be placed is equal to 3 In the first 1,000 square feet and 1 per each additional 1,000 square feet.
  3. Tests sites are to be cleaned of all adhesive residue, curing compounds, paints, sealers, floor coverings, and similar materials. 24 hours prior to the placement of test kits.
  4. Weigh test dish on site prior to start of test. Scale must report weight to 0.1 grams. Record weight and start time.
  5. Expose Calcium Chloride and set dish on concrete surface.
  6. Install test containment dome and allow test to proceed for 60 to 72 hours.
  7. Retrieve test dish by carefully cutting through containment dome. Close and reseal test dish.
  8. Weigh test dish on site recording weight and stop time.
  9. Calculate and report results as pounds of emission per 1,000 square feet per 24 hours."

- G. Testing Procedures Quantification of Acidity/Alkalinity (pH) Level
1. At or near the relative humidity test site and each vapor emission (calcium chloride) test site, perform pH test.
    - a. At each testing site, lay down a loose 2 foot by 2 foot sheet of rubber flooring or non perforated polyethelene sheet backed by plywood. Leave in place for 48 hours.
    - b. Remove rubber sheet/polyethelene and place several drops of distilled or de ionized water onto the concrete surface to form a puddle approximately 1 inches in diameter.
    - c. Allow the water to set for approximately 60 seconds.
    - d. Dip the pH paper into the water and remove immediately, compare color to chart provided by paper supplier to determine pH reading
  2. Record and report results.
- H. Testing Procedures:
1. Initial testing: Provide 3 tests for the first 1,000 square feet.
  2. Add one test for each additional 1,000 square feet.
  3. Concrete surface area to be tested shall be completely clean. Remove all adhesives, residue, debris and sealing compounds. Remove all dust by vacuum or other methods. Do not use chemicals of any kind to clean concrete.
  4. Perform moisture tests in strict accordance with the kit manufacturer's Instructions. Moisture tests shall remain undisturbed for 60 to 72 hours.
  5. Immediately after moisture test has been removed from test area, conduct pH test in area previously covered by plastic dome of moisture test kit.
  6. After completion of tests submit 2 copies of test data to the Architect. Submit a copy of the test data to all installers of flooring materials and resinous flooring materials scheduled to be installed.
  7. Provide additional testing in the event test results indicate higher moisture content than recommended by the flooring material and coating material manufacturers for the installation of their products. Perform such additional testing, at no additional cost to the Owner, after procedures have been performed to reduce moisture content to ratings acceptable to the various flooring and coating manufacturers.

End of Section

**Program of Structural Tests and Inspections**  
For compliance with Chapter 17 of the 9<sup>th</sup> Edition of the  
Massachusetts State Building Code

Project: South High Community School Site Enabling Package  
Location: Worcester, MA  
Owner: Worcester School District  
Architect of Record: Lamoureux Pagano and Associates  
Structural Engineer of Record (SER): Bolton & DiMartino, Inc.

This program of structural tests and inspections is submitted as a condition for issuance of the building permit in accordance with 780 CMR 1705.0 of the 9<sup>th</sup> edition of the Massachusetts State Building Code.

The Structural Engineer of Record (SER) shall review records of all inspections and tests. These tests and inspections shall be furnished to the Building Official, Owner, and Architect of Record by the relevant agencies. The SER shall review inspections and testing reports and shall give written notice of non-conforming work to the Contractor for correction and the Owner's representative. The Program of Structural Tests and Inspections does not relieve the Contractor of his/her responsibility and obligations to comply with the Contract Documents. Furthermore, the results of the Program of Structural Tests and Inspections do not relieve the Contractor of his/her responsibility.

A final report documenting completion of all the required Structural Tests and Inspections and correction of any of the discrepancies noted on interim reports will be submitted by the Structural Engineer of Record to the Building Official, Owner, and Architect of Record prior to the issuance of a certificate of use and occupancy.

Job site safety is solely the responsibility of the Contractor and not the part of Structural Tests and Inspections. Material and activities to be inspected do not include the Contractor's equipment or the means, methods, and procedures used to erect or install the materials or assemblies listed.

Prepared by the Structural Engineer of Record:

\_\_\_\_\_  
Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

Owner's Authorization:

Building Official's Acceptance:

\_\_\_\_\_  
Name (please print)

\_\_\_\_\_  
Name (please print)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

### Schedule of Structural Tests and Inspections

#### South High Community School Worcester, Massachusetts

The following categories of Structural Tests and Inspections are included in the program for structural tests and inspections for this project. The specific tests and inspections required for each category are listed on the page noted opposite the category.

|  |                    |
|--|--------------------|
| <b><u>Division 31</u></b>                | <b><u>Page</u></b> |
| • Controlled gravel fill (prepared fill) | <u>3</u>           |
| • In-situ bearing strata for footings    | <u>3</u>           |
| <b><u>Division 3</u></b>                 |                    |
| • Cast-in-place Concrete                 | <u>4</u>           |

The following categories are excluded from this Program of Structural Tests and Inspections, since they are designed by other structural engineers not under the aegis of the SER and the SER was not retained to provide performance specifications for their design. These other structural engineers must be assigned by the owner, architect, or construction contractor, as applicable, to be Special SER's for their respective designs and to provide a program of structural tests and inspections for their respective designs.

- Not Applicable

The following firms, agencies, or individuals (hereinafter referred to collectively as agents) except for the Geotechnical Engineer, will perform the tests and inspections under the direction of the SER. (The Geotechnical Engineer is responsible for directing the testing and inspection of controlled structural fill, in situ bearing stratum for footings.)

|                     |  |
|---------------------|--|
| <u>Abbreviation</u> | <u>Agent</u>                                 |
| SER                 | Structural Engineer of Record (Listed above) |
| OIAF                | Owner's Inspection Agency - Field            |
| OIAP                | Owner's Inspection Agency - Plant            |
| GE                  | Geotechnical Engineer                        |
| FQP                 | Fabricator's Quality Control Program         |
| CQP                 | Contractor's Quality Control Program         |
| NR                  | Not Required                                 |
| NA                  | Not Applicable                               |

**Controlled Gravel Fill (Prepared Fill) –31 20 00**

| Item   | Agent             | Scope  |
|--|-------------------|--|
| 1. Fill Material.  | GE<br>OIAF        | Test material for conformance to the specifications. Perform laboratory compaction tests in accordance with the specifications to determine optimum water content and maximum dry density (GE, OIAF) |
| 2. Installation of controlled gravel fill (780 CMR 1705.9.1 and 2) | GE<br>OIAF        | Provide full-time inspection of the installation in accordance with the specifications and 780 CMR 1705.9.1 and 2 (GE, OIAF)   |
| 3. Density of Fill (780 CMR 1705.9.3)                              | SER<br>GE<br>OIAF | Perform field density tests of the in-place fill in accordance with the specifications and 780 CMR 1705.9.3 (GE, OIAF). Review test reports for conformance to the construction documents (SER, GE). |

**In-Situ Bearing Strata for Footings – 31 20 00**

| Item                             | Agent      | Scope  |
|----------------------------------|------------|--|
| 1. Bearing strata for footings.  | GE         | Inspect strata for conformance to the structural drawings, specifications, and/or geotechnical report (GE).  |
| 2. Bearing surfaces of footings. | GE<br>OIAF | Inspect bearing surfaces for conformance to the requirements of the structural drawings, specifications, and/or geotechnical report. Observe field conditions for cold weather protection, as required (GE, OIAF). |

**Cast-in-Place Concrete – 03 30 00**

| <b>Item</b>                         | <b>Agent</b> | <b>Scope</b>  |
|-------------------------------------|--------------|---|
| 1. Mix Design.                      | SER<br>OIAF  | Review mix designs for conformance to specifications (SER). Perform plant inspection for use of proper mix proportions and mix techniques (OIAF).   |
| 2. Materials Certification          | OIAF         | Review for conformance to construction documents (OIAF).  |
| 3. Batching Plant.                  | SER<br>OIAF  | Review plant certificates and quality control procedures. Perform in-plant inspections as required to insure concrete quality (OIAF). Review OIAF reports (SER).  |
| 4. Reinforcing Installation.        | SER<br>OIAF  | Inspect reinforcing for size, quantity, condition, and placement of reinforcing steel and embedded items for conformance to the contract documents and approved shop drawings (SER, OIAF).  |
| 5. Formwork Geometry.               | OIAF         | Inspect formwork for general conformance with the construction documents (OIAF).  |
| 6. Concrete Placement.              | SER<br>OIAF  | Observe concrete placement operations. Verify conformance to specifications including cold-weather and hot weather placement procedures. During concrete placement, perform slump, density, and air content tests in conformance with construction documents (OIAF). Review OIAF reports (SER). |
| 7. Evaluation of Concrete Strength. | SER<br>OIAF  | Perform strength evaluation tests on concrete cylinders in accordance with the construction documents (OIAF). Review concrete test reports for conformance with the construction documents (SER).   |
| 8. Curing and Protection.           | SER<br>OIAF  | Review hot and cold weather protection procedures. After concrete placement, observe curing and protection procedures for conformance with construction documents (OIAF). Review OIAF reports (SER).  |



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**SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section.

**1.2 SUMMARY**

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
  - 1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
  - 2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
  - 3. Division 01 Section "Execution" for progress cleaning requirements.
  - 4. Divisions 02 through 16 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.
- C. Temporary utilities required include, but are not limited to:
  - 1. Water service and distribution.
  - 2. Temporary heating.
  - 3. Temporary power and lighting as specified in Division 16.
  - 4. Temporary telephone service.
- D. Temporary internet service, construction camera, and security.
- E. Temporary construction and support facilities required include, but are not limited to:
  - 1. Temporary field offices.
  - 2. Temporary signage.
  - 3. Waste disposal services.
  - 4. Temporary cranes, lifts, derricks, and hoisting services.
  - 5. Temporary staging and scaffolding.
  - 6. Temporary bracing, shoring, sheeting, and tie-downs.
  - 7. Temporary yard and storage on and off-site.
  - 8. Construction aids and miscellaneous services and facilities.
  - 9. Sweeping compound.

- 
10. Emergency portable generators of size required, if permanent power is temporarily unavailable. Dust control.
  11. Temporary protection of work in place and stored materials.
  12. Security and protection facilities required include, but are not limited to:
    - a. Temporary weather protection, enclosures, and covers.
    - b. Temporary fire protection.
    - c. Barricades, warning signs, lights.

### 1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

### 1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, Owner's Project Manager, testing agencies, inspection agencies, representatives of product manufacturers, suppliers, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.
- C. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

### 1.5 SUBMITTALS

- A. Construction Yard layout Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
  1. Locate Architect's / Owner's Project Manager's field office near Contractor's field office(s). Provide space for six (6) reserved car spaces to park adjacent to Architect's and Owner's Project Manager's field offices.

### 1.6 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

**PART 2 - PRODUCTS**

2.1 MATERIALS

- A. Temporary Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.
- B. Lumber, Plywood, Miscellaneous Hardware, Fasteners, and Lexan Plastic: Provide dimension lumber and plywood, fire treated as noted, otherwise preservative treated for items in contact with earth, for temporary structures.
- C. Mineral Surfaced Asphalt Coated Roofing for temporary structures.
- D. Asphaltic Concrete Paving for temporary structures.
- E. Metal bars, cable, and Portland cement concrete for deadmen and anchoring temporary structures.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading, and tie downs to resist overturning from wind loading.
- B. Construction Manager's Field Office: Of sufficient size to accommodate needs of the construction manager's personnel. Keep office clean and orderly. Furnish and equip office as follows:
  - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
  - 2. Conference room of sufficient size to accommodate meetings of project participants.
- C. Architect's and Owner's Project Manager's Field Office: Size and arrangement as indicated on drawing Sheet Number 01500B. Locate near existing sanitary sewer and water mains installed in the Site Preparation Phase and convenient to the Construction

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Manager's office. Provide weekly professional office cleaning; and cleaning and sanitizing of toilet rooms. Furnish and equip offices as follows:

1. Provide a furniture and office equipment budget of \$40,000.00 which includes ordinary furniture, a high speed copier/scanner/fax machine, and a large format scanner.
2. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Provide lighting fixtures capable of maintaining average illumination of 60 foot candles at desk height. Provide duplex outlets, telephone outlets, data wiring outlets near each desk on the adjacent wall and to one desk and the conference table run under floor. Power water heater and heat tapes, and HVAC equipment.
3. Connect to City water on site and City sewer on site. Provide hot and cold water in private toilet rooms for each sex. Provide 20 gallon hot water type heater under sink cabinet or instantaneous water heaters at each lavatory and sink. Provide a water closet and lavatory in each toilet room. Provide a sink in a residential type 6' long base cabinet with preformed plastic laminated countertop. Provide 2-18" wall cabinet each side of sink. Connect sink, lavatories, and water closet to water and sewer in protective covering with heat tape or other means to prevent freezing.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F winter and 75 to 80 deg F summer.

D. NOT USED

E. Provide a project sign in accordance with the layout as shown on drawing Sheet Number 01500C. Have sign maker contact architect for copy. Sign maker should layout and submit proof showing all names and text for approval prior to making sign.

F. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Sheds shall be of ordinarily non-combustible materials or fire treated lumber and plywood.
2. Store combustible materials apart from building.

## 2.3 TEMPORARY CRANES, LIFTS, DERRICKS, AND HOISTING SERVICES

A. Each Sub-contractor at any tier, or Trade Subcontractor at any tier shall provide their own lifts, derricks, hoisting services, etc. (including crane services outside the building) for their own work outside and inside the building to properly complete their work.

- B. All cranes, lifts, derricks, and hoisting equipment, machinery, and operation shall comply in all respects to the governing laws and codes.

## 2.4 TEMPORARY STAGING AND SCAFFOLDING

- A. Each Sub-contractor at any tier, or Trade Subcontractors shall furnish, erect, and maintain in safe condition all exterior and interior staging and scaffolding for their own use.
- B. All staging and scaffolding shall be enclosed at the ground by an six (6) foot high temporary construction fence as defined elsewhere in this Section.
- C. Staging and scaffolding shall comply in all respects to the governing laws and codes.

## 2.5 TEMPORARY BRACING, SHORING, SHEETING, AND TIE-DOWNS

- A. The General Contractor shall take all precautions to protect the Work against collapse or other damage by earth or construction loads, high winds, snow and rain loads, damage by adverse weather conditions or geological disturbances, or other cause, by temporary bracing shoring, sheeting, guying, lacing, covering, weighting, and other reasonable and prudent means.

## 2.6 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
  - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

# PART 3 - EXECUTION

## 3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

### 3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary connections to new utilities to remove effluent lawfully.
  - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service:
  - 1. Connect temporary water services to existing water mains and hydrants will be permitted subject to D.P.W. Water Operation's approval. At Substantial Completion, restore these facilities to condition existing before initial use.
- D. Sanitary Facilities:
  - 1. Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- G. Electric Power Service: Provide temporary electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install temporary electric power service overhead, unless otherwise indicated.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
  1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install a sufficient number of telephone line(s) for each contractor's field office to a centrally located backboard for contractors. Provide one pay phone or provide a phone for the use of construction personnel.
  1. Provide telephone lines/service for the Owner's Project Manager and Architect: Provide four voice telephone lines/numbers and small telephone system to accommodate one phone handset capable to answer all four lines/numbers at each desk. Provide a business DSL service, modem, and router networked via Ethernet to each computer/desk and the large format scanner and the multifunction copier, scanner, fax machine. Provide a dedicated telephone line for the multifunction copier, scanner, fax machine.
  2. At each telephone, post a list of important telephone numbers.
    - a. Police and fire departments.
    - b. Ambulance service.
    - c. Contractor's home office.
    - d. Project Emergency Contact List.
  3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- J. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities.
  1. Provide DSL line in primary field office.
  2. Provide DSL line in Owner's Project Manager and Architect field office. See above.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
  1. Provide non-combustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
  2. Do not store combustibles within 30 feet of any existing or new building.
  3. Do not store flammables within 50 feet of any existing or new building.

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4. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
    1. Protect existing site improvements to remain including curbs, pavement, and utilities.
    2. Maintain access for fire-fighting equipment and access to fire hydrants.
  - C. Parking: Provide temporary parking areas within the limits of work for construction personnel. Make arrangement for additional off-site parking areas.
  - D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
    1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
    2. Remove snow and ice as required to minimize accumulations.
  - E. Project Identification and Temporary Signs: Provide the project identification sign as in 2.2, E. Provide other signs to control access encourage safety, and direct activities may be installed as needed.
    1. Install signs to inform and direct the public and individuals seeking entrance to Project.
    2. Contractors and sub-contractors may install identification signs on temporary office trailers and storage trailers only.
    3. Unauthorized signs are not permitted. No sign or banner may be affixed to any fence or building.
    4. Provide temporary, directional signs for construction personnel and visitors.
    5. Maintain and touchup signs so they are legible at all times.
  - F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.
  - G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
    1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
  - H. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION



- A. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
  - 1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- B. Storm water Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- C. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- D. Site Enclosure Fence: Maintain site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
  - 1. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner's Project Manager and City Clerk of Works with one set of keys.
- E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- F. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
  - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- G. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
  - 1. Prohibit smoking in construction areas within sight of the existing school and street.
    - a. Violation of this provision will result in a complete ban on smoking anywhere on-site. Persons repeatedly violating this provision shall be barred from the site.
  - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

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3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

### 3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
  1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION

Section 01 56 39  
TEMPORARY TREE AND PLANT PROTECTION

PART 1 GENERAL

1.0 RELATED DOCUMENTS

- A. Division 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS and applicable parts of Division 01 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.

1.1 DESCRIPTION OF WORK

- A. Protection of existing trees and plants from damage as a result of the Contractor's operations including, but not limited to:
  - 1. Tree protection fencing.
  - 2. Root pruning and construction pruning.

1.2 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
  - 1. Section 31 10 00, SITE CLEARING.
  - 2. Section 31 20 00, EARTH MOVING: Silt fencing.
  - 3. Section 32 91 19, LANDSCAPE GRADING
  - 4. Section 32 93 00, TREES, PLANTS, AND GROUND COVERS: New plant material.

1.3 REFERENCED STANDARDS

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. American National Standards Institute (ANSI):

|        |  |
|--------|--|
| Z133.1 | Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush. |
| A300   | Tree Care Operations - Tree, Shrub And Other Woody Plant Maintenance - Standard Practices (All Parts)        |

2. International Society of Arboriculture (ISA):

Guide

Guide for Establishing Values of Trees and Other Plants

3. TCIA -- Tree Care Industry Association, Inc. (TCIA):

Ref. 1

Pruning Standards for Shade Trees

1.4 SUBMITTALS

- A. Prepare and submit drawings indicating the extent of tree protection fencing required.
- B. Proposed methods, and schedule for effecting tree and plant protection shall be submitted for approval.
- C. Proposed methods, materials, and schedule for root pruning, construction pruning, and tree fertilization, in accordance with ANSI A300 Tree Management standards specification writing guidelines, shall be submitted by Certified Arborist for approval.
- D. A Certified Arborist may be hired by the contractor to review various site conditions and perform work as listed in these specifications. In this case Arborist qualifications shall be submitted for Architect's review and approval.

1.5 QUALITY ASSURANCE

- A. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of tree protection and trimming.
- B. All tree work shall be performed by a professional Certified Arborist with a minimum five years experience, who has successfully completed a certification program equal to the Massachusetts Certified Arborist (MCA) program/examination sponsored by the Massachusetts Arborists Association, 8-D Pleasant Street, South Natick, MA 01760; (508) 653-3320; FAX: (508) 653-4112; E-mail: MaarbAssn@aol.com.
- C. Arborist shall have the following minimum qualifications:
  - 1. Membership in:
    - a. TCIA -- Tree Care Industry Association, Inc.
    - b. ISA -- International Society of Arborists
  - 2. Meet state requirements for insurance.
  - 3. Licenses for application and use of pesticides.

1.6 DAMAGE PENALTIES

- A. Certain specimen trees within the construction areas and in other key locations will be identified by the Owner and the Architect, and marked with red tags. Loss of any of these trees will result in fines assessed at \$10,000 per tree. Damage to or loss of all other trees on the property will be assessed at the rate of \$400 per inch caliper of the tree.

- B. A fine of \$2,500 will be levied against the Contractor for each incident of construction inside tree protection areas.
- C. Damages to trees, shrubs, and other vegetation will be assessed by the Architect and Owner in accordance with the ISA Guide.
- D. Trees or roots visibly damaged will cause the Owner to withhold from the Contractor an assessed amount conforming to the requirements stipulated above for a period of two years. After that period the impact of the damage to any tree will be assessed accordingly.
- E. If any trees or shrubs designated to be saved are damaged and replacement is required, a number and diameter of trees or shrubs of the same species and variety, as specified by the Owner and Architect, shall be furnished and planted by the Contractor. The total inch diameter of the replacement trees or shrubs shall equal the diameter of the tree or shrub to be replaced.

## PART 2 PRODUCTS

### 2.1 TREE PROTECTION FENCING

- A. Tree protection fencing shall be the following:
  - 1. Galvanized chain link fencing, 6 ft. high.
  - 2. Fabric shall be a good commercial quality of steel wire of 2 in. mesh and 11 gage.
  - 3. Fittings shall be malleable iron casting, wrought iron forgings, or pressed steel and provided with pin connections. Equipment shall be designed to carry 100% overload.
  - 4. Piping shall be steel conforming to ASTM A 120 except that pipe shall be unthreaded and untested for water pressure.
- B. Stakes for fencing shall be 9 ft. galvanized steel posts, driven a minimum of 3 ft. into the ground. Posts shall be spaced 10 ft. o.c. maximum.
  - 1. No fence posts shall be driven until underground utilities have been located by "DigSafe 811". Concrete or weighted bases may be acceptable alternatives used for surface mounting. Review with Architect for approval.
- C. For fencing within the drip line of trees, surface mounted post anchors may be acceptable. Review with Architect to obtain written approval prior to installing. Post installation shall not damage tree root systems.

### 2.2 ROOT PRUNING

- A. Peat moss and mulch materials shall be as specified under Section 329300, TREES PLANTS, AND GROUND COVERS.
- B. Liquid fertilizer to be applied to root pruned and construction pruned trees shall be Peters M 77 Sequestered-Chelated Soluble Fertilizer manufactured by W.R. Grace and Co., Cambridge, MA 02140, Gold Start Liquid Fertilizer, manufactured by Nutra-Flo Company, 1919 Grand Ave, Sioux City, IA 51106-5708; Phone: 712-277-2011; 800-831-4815; Fax: 712-279-1946; Agro- Culture Liquid Fertilizer, manufactured by Agro-Culture Liquid Fertilizers, 3055 W. M-21, P.O. Box 150, St. Johns, Michigan 48879; 1-800-678-9029, or approved equal. Liquid fertilizer shall be approved by Landscape Architect or Certified Arborist.

- C. Dormant oil spray shall be a dormant miscible spray equal to Sunspray' Scalecide' or Volck Oil.
- D. Insecticide shall be EPA approved for the intended use and the names should be provided to, and approved by the Landscape Architect prior to use.

### PART 3 EXECUTION

#### 3.1 PROTECTION FOR EXISTING TREES TO BE PRESERVED:

- A. All trees to be preserved on the property shall be protected against damage from construction operations.
  - 1. Includes associated understory and areas within dripline of the tree.
- B. Only those trees located within the limit of work to be constructed as indicated, shall be removed.
  - 1. All trees to remain shall be flagged for review after the location of improvements to be constructed are staked in the field.
  - 2. Any tree to be removed shall be reviewed by the Architect and Owner for approval prior to removal.
- C. Erect fencing and armor protection prior to beginning any clearing, demolition or construction activity, and unless otherwise instructed, maintain in place until construction is completed.
  - 1. Obtain approval of installation of tree barricade fencing from Owner and Architect prior to the initiation of any removal of vegetation and construction.
  - 2. Tree protection barricade shall be erected at the edge of the dripline except in extreme circumstances and with the approval of the Architect, fencing may be located at the edge of the root protection zone.
    - a. For trees 10 inch caliper and less, the minimum distance the barrier shall be erected is ten (10) feet from the trunk of tree or clump of trees.
  - 3. Trees immediately adjacent to and within one hundred feet (100) of any construction activities are to be protected by barricade fencing; subject to approval of the Architect and Owner.
  - 4. Trees exposed to construction activity within the dripline or within twenty-five (25) feet of any construction activity are to have trunks protected with tree armor in addition to barricade fencing.
  - 5. The tree protection barricade shall be placed before any excavating or grading is begun and maintained for the duration of the construction work unless otherwise directed.
  - 6. No material shall be stored or construction operation shall be carried on within the tree protection barricade or within tree dripline.
  - 7. Tree protection barricade shall remain until all work is completed.
  - 8. Remove tree protection barricade at commencement of finish grading.
  - 9. Remove tree armor immediately prior to Substantial Completion.

- D. Protect tree trunk with tree armor to a height of 8' or to the limits of lower branching (when exposed to construction activity within the drip line) with 2x4's butted side to side completely around trunk.
  - 1. Wire wrap do not nail, around trees.
- E. Protect trees that are to remain, whether within barricade fencing or not, from the following:
  - 1. Compaction of root area by equipment or material storage; construction materials shall not be stored closer to trees than the farthest extension of their limbs (dripline).
  - 2. The proposed finished grade within the root protection zone (RPZ) of any preserved tree shall not be raised or lowered more than three (3) inches.
    - a. Retaining methods can be used to protect and/or provide lateral support to the area outside the root protection zone.
  - 3. Trunk damage by moving equipment, material storage, nailing or bolting.
  - 4. Strangling by tying ropes or guy wires to trunks or large branches.
  - 5. Poisoning by pouring solvents, gas, paint, etc., on or around trees and roots.
  - 6. Cutting on roots by excavating, ditching, etc.
    - a. Prior to excavation within the tree drip lines or the removal of trees adjacent to other trees that are to remain, make a clean cut between the disturbed and undisturbed root zones with a rock saw or similar equipment to minimize root damage to be performed by Certified Arborist.
    - b. Refer to EXCAVATION AROUND TREES for additional information.
  - 7. Damage of branches by improper pruning.
  - 8. Drought from failure to water or by cutting or changing normal drainage pattern past roots. Contractor shall provide means as necessary to ensure positive drainage.
  - 9. Changes of soil pH factor by disposal of lime base materials such as concrete, plaster, lime treatment at pavement subgrade, etc. When installing concrete adjacent to the root zone of a tree, use a minimum 6 mil. plastic vapor barrier behind the concrete to prohibit leaching of lime into the soil.
  - 10. Do not cut roots 1" in diameter or over without approval of Owner's Representative. All excavation and earthwork within the RPZ of trees shall be done by hand and performed by a Certified Arborist.
  - 11. Protect all existing trees near areas to be stabilized from underground contaminations by placing a 6 mil. Plastic film barrier along exposed vertical cut extending a minimum 12" into undisturbed subgrade below depth of stabilization.
  - 12. No vehicular traffic shall occur within the drip line of any tree; including parking of vehicles.
  - 13. No soil shall be spread, spoiled or otherwise disposed of under any tree within the RPZ.
- F. Any damage done to existing tree crowns or root systems shall be repaired by the Arborist to the satisfaction of the Architect and Owner's Representative.
  - 1. Broken branches shall be cut cleanly.
  - 2. Any roots cut shall be cut cleanly with a saw other means approved by the Architect and Owner's Representative.
- G. Damages to trees caused through negligence of Contractor or his employees will be assessed by Owner and Project Arborist as described in Paragraph 1.07.

3.2 ROOT PROTECTION ZONE:

A. Root Protection Zone (RPZ).

1. No disturbance shall occur closer to the tree than one-half the radius of the RPZ or within five (5) feet of the tree whichever is greater.

3.3 PROTECTED ROOT ZONE IMPACTS:

A. Those trees to remain which have some encroachment on their protected root zone shall have the following maximum allowable impacts:

1. Minimum Protection Criteria 'A': No disturbance of natural grade, e.g. trenching or excavation, can occur closer to the tree than one-half the radius of the RPZ or within five (5) feet of the tree whichever is greater.
2. Minimum Protection Criteria 'B': No cut or fill greater than three (3) inches will be located closer to the tree trunk than  $\frac{1}{2}$  the RPZ radius distance.

B. Trees impacted shall have a minimum of a six (6) inch layer of mulch placed and maintained over the root protection zone and the undisturbed area within the dripline.

1. Immediate pruning and fertilization shall occur per the pruning and fertilization sections of this specification.
2. Provide water in a slow drip manner to impacted trees as approved by the Architect and Owner's Representative.
3. Provide water to apply equivalent to 1 inch once per week to deeply soak in over the area within the dripline of the tree during periods of hot, dry weather.
4. Spray tree crowns periodically to reduce dust accumulation on the leaves.

3.4 EXCAVATING AROUND TREES

A. Excavate within the dripline of trees only where required and when absolutely necessary.

1. Any excavation within the RPZ of trees shall be under the direction of the Arborist.
2. Arborist shall be at site at all times while excavation is occurring within the RPZ.
3. Air spade all removals within the RPZ.
4. Refer to ROOT PROTECTION ZONE.

B. When excavating for new construction is required within the PRZ, air spade and hand excavate to minimize damage to root systems.

1. Use narrow tine spading forks and comb soil to expose roots.
2. Relocate roots back into backfill areas wherever possible.
3. If large main lateral roots are encountered, expose beyond excavation limits as required to bend and relocate without breaking.
4. If root relocation is not practical, clean cut roots using sharp ax approximately three (3) inches back from new construction.

C. Where existing grade is above new finish grade, carefully excavate within the dripline to the new finish grade.

1. Carefully hand excavate an additional six (6) inches below the finish grade.



2. Use narrow tine spading forks to comb the soil to expose the roots, and prune the exposed root structure as recommended by the Arborist.
  3. Keep the exposed roots damp.
  4. Treat the cut roots as specified and as recommended by the Arborist.
  5. After pruning and treatment of the root structure is complete, backfill to finish grade with eight (8) inches of approved plant mix.
- D. Where noted on plan, use airspade to expose roots for required cutting to accommodate hardscape elements. Architect to verify all cuts prior to proceeding.
- E. Temporarily support and protect roots against damage and covered with recommended landscape material.

### 3.5 INSTALLATION OF FENCING

- A. Prior to start of demolition work and clearing and grubbing operations, tree protection fencing shall be installed in accordance with Paragraph 3.01C.

### 3.6 ROOT PRUNING

- A. Where construction will occur within drip line of existing trees designated to remain, roots shall be pruned in accordance with ANSI A300.
- B. All root pruning shall be done by Certified Arborist only. Trenching, vibrating plow, and stump grinding are NOT suitable means for root pruning.
- C. Roots greater than 1 in. diameter shall be pruned by means of a hand saw, or other approved means.
- D. Install root protection measures as prescribed by Certified Arborist.

### 3.7 CROWN REDUCTION PRUNING

- A. Crown reduction pruning shall be performed in accordance with ANSI A300 Part 1 Pruning standards using the Reduce Method (7.4). A written description or field review that details the location and size of branches to be removed shall be approved by the Architect and Certified Arborist prior to the start of work.

### 3.8 FERTILIZATION AND INSECT SPRAYING

- A. Root pruned and construction pruned trees shall be treated with liquid fertilizer, dormant oil spray, and insecticide as prescribed by Certified Arborist.
- B. Liquid fertilizer shall be applied at a rate recommended by the manufacturer and as required by ANSI A300 Part 2 Soil Management standards.
- C. Dormant oil spray shall be applied in early spring before buds begin to swell at a rate recommended by the manufacturer.
- D. Insecticide spray shall be applied twice to root pruned trees following application of dormant oil spray. Spray insecticide at rates recommended by spray manufacturer at intervals appropriate for effective insect control.

3.9 REMOVAL OF PROTECTION

- A. All protection shall remain in place throughout the construction period. Remove protection devices only after written permission has been granted by the Architect.

END OF SECTION

Section 01 60 00  
PRODUCT REQUIREMENTS

**PART 1 - GENERAL**

1.1 SECTION INCLUDES

- A. Definition of Terms
- B. Basic product requirements.
- C. General environmental requirements for products.
- D. Recycled content of materials.
- E. Regional materials.
- F. Sustainable wood, chain of custody.
- G. Owner furnished products.
- H. Product delivery and handling requirements.
- I. Product storage and protection requirements.
- J. Construction waste management.

1.2 RELATED SECTIONS

- A. Section 01 25 13 –PRODUCT SUBSTITUTION PROCEDURES:
  - 1. Product options.
  - 2. Product substitution procedures.
- B. Section 01 33 29 - SUSTAINABLE DESIGN REPORTING: Special administrative and procedure requirements related to the Owner's *LEED v4, LEED for Building Design and Construction, LEED BD+C: Schools* rating system certificate goals of energy conservation and efficiency, indoor air quality, and natural resource efficiency.
- C. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.

1.3 DEFINITION OF TERMS

- A. "Products" is defined as new material, machinery, components, equipment, fixtures, and systems used in the Work. Products do not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for re-use.
- B. "Materials" are products that are shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
- C. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

- D. Definitions in this article are not intended to negate the meaning of other terms used in Contract Documents, including "specialties", "systems", "structure", "finishes", "accessories", "furnishings", "special construction", and similar terms, which are self-explanatory and have recognized meanings in the construction industry.

#### 1.4 BASIC PRODUCT REQUIREMENTS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
  - 1. Where possible utilize materials harvested and manufactured regionally, within a 500-mile radius of the project site. Refer to Regional Materials Article herein this Section.
- B. To the fullest extent possible, provide products of the same kind, from a single source.
- C. Provide interchangeable components of the same manufacturer, for similar components.
- D. When the Construction Manager has the option of selecting two or more products, ensure that products selected shall be compatible with products previously installed or approved.
- E. Provide all products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
- F. Galvanic Corrosion: Install materials in manner which will effectively isolate dissimilar metals which may potential for galvanic corrosion. Use non-absorptive dielectric material, isolation coatings, or other protective isolator approved by Architect.
- G. Fasteners, Anchors, and Connections: Provide all fasteners, anchors, and connections needed to safely, securely, and appropriately secure all Work permanently in place.
  - 1. General: The Contractor is solely responsible for the capacity, suitability, adequacy, and safety of all welded, fastened and anchored connections.
    - a. Comply with applicable code requirements regarding fastener selection and installation.
    - b. Provide at least two fasteners for each individual item being fastened.
    - c. Utilize fastener manufacturer's published load tables for working loads to assist in determining fastener size and space. Do not use ultimate load capacity in determining fastener selections.
    - d. Provide a minimum safety factor of 4.
    - e. Select and utilize fasteners having minimum galvanic corrosion factor.
    - f. Hydrogen embrittlement prevention:
      - 1) Do not use high-strength and low-alloy fasteners which have been subjected to an acid pre-treatment (because they can become brittle and fail), utilize instead equivalent capacity and size bi-metal,

stainless steel or high strength aluminum fasteners, as appropriate to the conditions and materials where being used.

- 2) Utilize low-hydrogen electrodes for welding high-strength steels to prevent hydrogen embrittlement.
2. To permit the Construction Manager control over means and methods, some fastener conditions may not be fully defined in the Contract Documents. In particular, individual specification sections that require delegated independent engineering. In such instances the Construction Manager is fully responsible to determine method of fastening appropriate for each condition. The Construction Manager shall take into consideration substrate material(s) and product(s) being fastened, live and dead loading, and both atmospheric and visual exposure considerations. Construction Manager is responsible to determine fastener type, material, finish, size, diameter, length and spacing.
3. Torque structural fasteners as recommended by fastener manufacturer, or as otherwise specified in the Contract Documents.
4. The Construction Manager is solely responsible for the capacity, suitability, adequacy, and safety of all welded, fastened and anchored connections.

H. Permanent Labels and Nameplates:

1. Restrictions:
  - a. Do not provide labels, nameplates, or trademarks which are not required by code, or regulations.
  - b. Do not provide labels, nameplates or trademarks when individual specification sections specifically exclude them.
  - c. Do not expose manufacturers, suppliers, or installer's name, logo, or trade names on normally visible surfaces.
2. Location for required labels: Required labels, approval plates and stamps shall be located on a concealed surface, or where required for observation after installation on accessible non-conspicuous surface.
3. Data Plates: Provide permanent data plate on each item of service-connected or power-operated equipment.
  - a. Data Plate Information: Include manufacturer, model, serial number, date of manufacture, capacity, ratings, power requirements, and all other similar essential data.
  - b. Locate data plates on easily accessible surface that is inconspicuous in occupied spaces.

1.5 GENERAL ENVIRONMENTAL REQUIREMENTS FOR PRODUCTS

- A. General: Comply with LEED Certification requirements and as specified herein. Prohibit the use of or incorporation into the work of materials which contain toxic, hazardous and harmful materials.
1. Hazardous materials: Defined as pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA), the International Agency for Research on Cancer (IARC) or regulated under OSHA Hazard Communication Standard, 29 CFR 1910.1200.
  2. Harmful materials: Defined as materials which contain the presence of chemical, physical, or biological elements or agents which adversely affect

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- human health or welfare; unfavorably alter ecological balances; or degrade the utility of the environment for aesthetic, cultural, or historical purposes.
3. Owner restricted materials: Defined as all products to which the Owner has a reasonable objection because of its content, composition, properties, or characteristics.
- B. Vapors, Gases, Fumes, Odors:
1. General: Comply with all state and federal VOC requirements. Where ever possible use non-VOC materials.
    - a. Limit use of products to the greatest extent possible which have "off-gassing", fumes, flammability, and other harmful characteristics.
      - 1) Prohibit use of products which contain substances that contribute significantly to the production of photochemical smog, tropospheric ozone, or poor indoor-air quality.
    - b. Limit use of ozone-depleting compounds to the greatest extent possible. An ozone-depleting compound is any compound with an ozone-depletion potential greater than 0.01 (CFC 11 = 1).
    - c. Use organic and biodegradable cleaners to the greatest extent possible.
  2. Do not install, use for installation, and use for cleaning those materials which may produce objectionable (to Owner and public) vapors, gases, fumes, odors, or similar conditions.
  3. Do not install or use products which may have possible chemical or biological reactions with other on-site materials.
- C. Toxicity of prefabricated wood products (composite wood and agrifiber products): Products shall contain no added urea-formaldehyde resins.
1. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall contain no added urea-formaldehyde resins.
- D. Adhesives: Provide adhesives approved by the manufacturer's of the products being adhered which are low-VOC or no-VOC, non-flammable, waterproof after cured, odor free and comply with LEED certification requirements.
1. All adhesives, sealants and sealant primers used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the requirements of the South Coast Air Quality Management District (SCAQMD) Rule 1168 VOC limits, Less Water and Less Exempt Compounds and Green Seal GS-36 Aerosol Adhesives VOC Limits.
    - a. South Coast Air Quality Management District (SCAQMD) Rule 1168 VOC limits, Less Water and Less Exempt Compounds:
      - 1) Architectural Applications VOC Limit [g/L less water]
        - a) Indoor Carpet Adhesives 50
        - b) Carpet Pad Adhesives 50
        - c) Wood Flooring Adhesives 100
        - d) Rubber Floor Adhesives 60
        - e) Subfloor Adhesives 50
        - f) Ceramic Tile Adhesives 65
        - g) VCT & Asphalt Adhesives 50

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- |    |                                     |     |
|----|-------------------------------------|-----|
| h) | Drywall & Panel Adhesives           | 50  |
| i) | Cove Base Adhesives                 | 50  |
| j) | Multipurpose Construction Adhesives | 70  |
| k) | Structural Glazing Adhesives        | 100 |
- 2) Specialty Applications      VOC Limit [g/L less water]
- |    |                                  |     |
|----|----------------------------------|-----|
| a) | PVC Welding                      | 510 |
| b) | CPVC Welding                     | 490 |
| c) | ABS Welding                      | 325 |
| d) | Plastic Cement Welding           | 250 |
| e) | Adhesive Primer for Plastic      | 550 |
| f) | Contact Adhesive                 | 80  |
| g) | Special Purpose Contact Adhesive | 250 |
| h) | Structural Wood Member Adhesive  | 140 |
| i) | Sheet Applied Rubber Lining      | 850 |
| j) | Top & Trim Adhesive              | 250 |
- 3) Sealants      VOC Limit [g/L less water]
- |    |               |     |
|----|---------------|-----|
| a) | Architectural | 250 |
| b) | Other         | 420 |
- 4) Substrate Specific Applications      VOC Limit [g/L less water]
- |    |                               |    |
|----|-------------------------------|----|
| a) | Metal to Metal                | 30 |
| b) | Plastic Foams                 | 50 |
| c) | Porous Material (except wood) | 50 |
| d) | Wood                          | 30 |
| e) | Fiberglass                    | 80 |
- 5) Sealant Primers      VOC Limit [g/L less water]
- |    |                          |     |
|----|--------------------------|-----|
| a) | Architectural Non Porous | 250 |
| b) | Architectural Porous     | 775 |
| c) | Other                    | 750 |
2. Green Seal GS-36 Aerosol Adhesives VOC Limits:
- |    |   |   |
|----|---|---|
| a. | Aerosol Adhesives                             | VOC Limit [g/L less water]<br>by weight |
| 1) | General purpose mist spray                    | 65% VOCs                                |
| 2) | General purpose web spray                     | 55% VOCs                                |
| 3) | Special purpose aerosol adhesives (all types) | 70% VOCs                                |
- E. Carpet systems: Refer to Section 09 68 00 - Carpeting for VOC requirements.
- F. Interior Paints: Provide products that comply with specified VOC limits, refer to Section 09 91 00 – PAINTING for additional requirements.
1. For interior applications use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24) and the chemical restrictions (Restricted Components listed below) of Green Seal Standard GS-11, Paints, First Edition, May 20, 1993; Green Seal Standard GC-03, Anti-Corrosive Paints, Second Edition, January 7, 1997; and South Coast Air Quality Management District Rule 1113, Architectural Coatings, rules in effect on January 1, 2004, as follows:
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- a. Green Seal GS-11 Limits for Interior Paints:
  - 1) Flat Paints and Coatings: VOC not more than 50 g/L.
  - 2) Non-Flat Paints and Coatings: VOC not more than 150 g/L.
- b. Green Seal GS-03 Limits for Anti-Corrosive Coatings:
  - 1) Anti-Corrosive Coatings (Gloss, Semi-Gloss and Flat): VOC not more than 250 g/L.
- c. South Coast Rule #1133 VOC Limits for Architectural Coatings:
  - 1) Bond breakers: VOC not more than 350 g/L.
  - 2) Clear wood finishes:
    - a) Varnishes: VOC not more than 350 g/L.
    - b) Sanding sealers: VOC not more than 350 g/L.
    - c) Lacquer: VOC not more than 550 g/L.
  - 3) Clear brushing lacquers: VOC not more than 680 g/L.
  - 4) Concrete curing compounds: VOC not more than 350 g/L.
  - 5) Dry-fog coatings: VOC not more than 400 g/L.
  - 6) Fireproofing exterior coatings: VOC not more than 350 g/L.
  - 7) Fire retardant coatings:
    - a) Clear: VOC not more than 650 g/L.
    - b) Pigmented: VOC not more than 350 g/L.
  - 8) Graphic art (sign) coatings: VOC not more than 500 g/L.
  - 9) Industrial maintenance (IM) coatings: VOC not more than 250 g/L.
  - 10) High temperature (IM) coatings: VOC not more than 420 g/L.
  - 11) Zinc rich (IM) primers: VOC not more than 100 g/L.
  - 12) Japans/faux finishing coatings: VOC not more than 350 g/L.
  - 13) Magnesite cement coatings: VOC not more than 450 g/L.
  - 14) Mastic coatings: VOC not more than 300 g/L.
  - 15) Metallic pigmented coatings: VOC not more than 500 g/L.
  - 16) Multi-color coatings: VOC not more than 250 g/L.
  - 17) Pigmented lacquer: VOC not more than 550 g/L.
  - 18) Pre-treatment wash primers: VOC not more than 420 g/L.
  - 19) Primers, sealers and undercoaters: VOC not more than 200 g/L.
  - 20) Quick-dry enamels: VOC not more than 250 g/L.
  - 21) Quick-dry primers sealers and undercoats: VOC not more than 200 g/L.
  - 22) Recycled coatings: VOC not more than 250 g/L.
  - 23) Rust preventative coatings: VOC not more than 400 g/L.
  - 24) Shellac-Clear: VOC not more than 730 g/L.
  - 25) Shellac-Pigmented: VOC not more than 550 g/L.
  - 26) Specialty primers: VOC not more than 350 g/L.
  - 27) Stains: VOC not more than 250 g/L.
  - 28) Sealers:
    - a) Waterproofing sealers: VOC not more than 250 g/L.
    - b) Waterproofing concrete and masonry sealers: VOC not more than 400 g/L.
  - 29) Wood preservatives: VOC not more than 350 g/L.



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- G. Sealants: Provide products that comply with specified VOC limits. Refer to Section 07 92 00 – JOINT SEALANTS for additional requirements.
1. Only use sealant and primers that comply with the following limits for VOC content:
    - a. Architectural Sealants: 250 g/L.
    - b. Roofing Sealants: 450 g/L
    - c. Roadway Sealants: 250 g/L.
    - d. Sealant primer: 250 g/L
  2. Sealants containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds, are not permitted.
  3. Avoid the use of the following products: Butyl Rubber; Solvent Acrylic; Neoprene; Styrene Butadiene Rubber; Nitril.
- H. Material Safety Data Sheets (MSDS): Obtain and maintain on-site record data sheets for each product brought onto the Site.
1. Maintain an organized file of Material Safety Data Sheets at the job-site for quick reference.
  2. Furnish MSDS for all finishes, paints, coatings, curing compounds, sealers, adhesives, mastics, waterproofing, dampproofing, sealants, cleaning chemicals, carpets, upholstery, fabrics and all similar products.
- I. Cleaning and maintenance products:
1. Provide data on manufacturers' recommended maintenance, cleaning, refinishing and disposal procedures for materials and products utilized. These procedures are for final Construction Manager cleaning of the project prior to substantial completion and for provided materials and products as required by the specific specification sections.
    - a. Where chemical products are recommended for these procedures, provide documentation to indicate that no component present in the cleaning product at more than 1% of the total mass of the cleaning product is a carcinogen or reproductive toxicant as defined in the lists in this specification section.
    - b. For purposes of reporting, identification of product VOC contents shall not be limited to those regulated.
  2. Avoid cleaning products containing alpha-pinene, d-limonene or other unsaturated carbon double bond alkenes due to chemical reactions with ozone to form aldehydes, acidic aerosols, and ultra fine particulate matter in indoor air.
- J. Establish written Construction Manager's safety and emergency response procedures for safety precautions, accidents, emergency conditions, and clean-up methods.
- 1.6 OWNER'S PROPRIETARY PRODUCTS
- A. Owner's proprietary products: Under provisions of Massachusetts General Laws, Chapter 30, Section 39M(b) the Owner has determined that specific products shall be proprietary for 'sound reasons in the public interest'. This determination has
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been made under vote of the Building Committee, and has been recorded in writing for public record.

- B. The following products are designated as proprietary:
1. Automatic temperature controls: Alerton/ABS.
  2. Condensing boilers: Lochinvar "Crest".
  3. Access control and video surveillance (with Axis camera): Genetec Unified Security System.
  4. Point of sale system at Cafeteria: Mosaic.
  5. Non-interchangeable core key cylinders: Corbin-Russwin.
  6. IP Telephone system: ShoreTel.
  7. Network switches: HP.
  8. Wireless access points: Cisco "Meraki".
  9. Document cameras: Epson.
  10. Interactive ultra-short-throw projectors with laser light source: Epson "Brightlink".

#### 1.7 OWNER FURNISHED PRODUCTS

- A. Owner Furnished Products: As provided in the General Conditions, the Owner will provide products by others under a separate agreements.
1. Owner's responsibilities regarding Owner furnished products:
    - a. Arrange for and deliver Owner reviewed shop drawings, product data, and samples to Construction Manager.
    - b. Arrange and pay for product delivery to site.
    - c. On delivery, inspect products jointly with Construction Manager.
    - d. Submit claims for transportation damage, and replace damaged, defective, or deficient items.
    - e. Arrange for manufacturers' warranties, inspections, and service agreements.
  2. Construction Manager's responsibilities regarding Owner furnished products:
    - a. Review Owner reviewed shop drawings, product data, and samples to Construction Manager.
    - b. For Owner-Furnished, Construction Manager Installed (OFCl) Products: Receive and unload products at site, inspect for completeness or damage, jointly with Owner.
    - c. Handle, store, and provide temporary protection.
    - d. Repair or replace items damaged after receipt.
    - e. As required by this Contract, finish, install, and clean products.
    - f. Provide protection of installed work.
    - g. When not installed under this Contract, the Construction Manager shall coordinate Owner installed work with interfacing work of this Contract. The Construction Manager shall provide temporary protection and final cleaning of Owner installed products, except as directed otherwise.

3. Items noted in Drawings as "Not in Contract" or "NIC", identify work or products which are furnished by Owner; such work requires coordination with the Work of this Contract and may require installation by the Construction Manager.
- B. The Construction Manager has coordinating responsibility for Testing laboratory services as identified under Section 01 45 29 - TESTING LABORATORY SERVICES and as specified under individual specification sections.

#### 1.8 PRODUCT DELIVERY AND HANDLING REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions and as specified in individual specification sections.
  1. Packing: Arrange for the return of packing materials, such as wood pallets, where economically feasible.
  2. Ductwork: As a prerequisite requirement for Massachusetts CHPS, all ductwork shall be sealed from time of manufacturer, with seals intact upon delivery to construction site, and remain so, until ready for installation. Construction Manager is jointly responsible with Trade Contractor to ensure ducts are properly sealed and maintained.
    - a. Store ductwork in clean dry conditions and keep sealed while it is stored.
- B. Packaging: Deliver materials in recyclable or in reusable packaging such as cardboard, wood, paper, or reusable blankets, which will be reclaimed by supplier or manufacturer for recycling.
  1. General: Minimize packaging materials to maximum extent possible while still ensuring protection of materials during delivery, storage, and handling.
    - a. Unacceptable Packaging Materials: Polyurethane, polyisocyanurate, polystyrene, polyethylene, and similar plastic materials such as "foam" plastics and "shrink-fit" plastics.
    - b. Reusable Blankets: Deliver and store materials in reusable blankets and mats reclaimed by manufacturers or suppliers for reuse where program exists or where program can be developed for such reuse.
      - 1) Non-returnable containers should be donated to local and community organizations to the greatest extent possible to reduce quantity of disposed materials.
    - c. Pallets: Where pallets are used, suppliers shall be responsible to ensure pallets are removed from site for reuse or for recycling. Avoid use of virgin wood pallets whenever possible. It is preferable that pallets be manufactured from recycled wood and recycled plastic.
    - d. Corrugated Cardboard and Paper: Where paper products are used, recycle as part of construction waste management recycling program, or return to material's manufacturer for use by manufacturer or supplier.
    - e. Sealants, Paint, Primers, Adhesives, and Coating Containers: Return to supplier or manufacturer for reuse where such program is available.
  2. Purchase materials in bulk where possible. Take measures to avoid individual packaging for volume purchases.

- C. Labeling of plastics used for packaging: Plastic is marked by manufacturers for type of plastic material in accordance with the Society of Plastic resin codes. Maintain marks, or sort by manufacturer's resin codes for recycling purposes.
  - 1. Type 1: Polyethylene Terephthalate (PET, PETE).
  - 2. Type 2: High Density Polyethylene (HDPE).
  - 3. Type 3: Vinyl (Polyvinyl Chloride or PVC).
  - 4. Type 4: Low Density Polyethylene (LDPE).
  - 5. Type 5: Polypropylene (PP).
  - 6. Type 6: Polystyrene (PS).
  - 7. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.
- D. Schedule deliveries to avoid delays in installation of products, to minimize long-term storage, to prevent overcrowding of construction spaces and to limit potential damage to stored materials. Coordinate with installation to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
- E. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- F. Provide equipment and personnel to handle and store products by methods to prevent soiling, disfigurement, or damage.

#### 1.9 PRODUCT STORAGE AND PROTECTION REQUIREMENTS

- A. Store and protect products in accordance with manufacturer's instructions and as specified in individual specification sections.
  - 1. Provide all necessary equipment and personnel to store products by methods to prevent soiling, disfigurement and damage.
  - 2. Avoid excessive material handling and potential product damage, locate storage areas convenient to work areas.
  - 3. Store and protect products with seals and labels intact and legible.
  - 4. Store and handle materials in a manner as to prevent loss from weather and other damage.
- B. For exterior storage of fabricated products, place on sloped supports, above ground.
- C. Provide off-site storage and protection when site does not permit on-site storage or protection.
  - 1. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
  - 2. Store sensitive products in weather-tight, climate controlled enclosures.
  - 3. Prevent contact with material that may cause corrosion, discoloration, or staining.

- D. Store loose granular materials on solid flat surfaces in a well-drained area; prevent mixing with foreign matter.
- E. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- F. Store heavy materials in locations and in a manner that will not damage or disfigure existing, or new construction.

#### 1.10 MOLD PROTECTION

- A. General:
  - 1. Keep building materials dry to prevent the growth of mold and bacteria, including, but not limited to: gypsum wallboard, wood, porous insulation, paper, and fabric.
  - 2. Cover materials to prevent rain damage, and if resting on the ground, use spacers to allow air to circulate between the ground and the materials.
  - 3. Thoroughly dry all water damaged materials within 24 hours from time of moisture damage. Materials that have been damp or wet for more than 24 hours shall be jointly reviewed by Construction Manager and Architect, or Owner's Project Manager to determine whether damp/wet materials need to be disposed.
    - a. Review moisture damaged materials for signs of mold and mildew, including any with moisture stains, from the site and properly dispose of them.
    - b. Replace water damaged and moldy materials with new, undamaged materials.

#### 1.11 CONSTRUCTION WASTE MANAGEMENT

- A. Source separation: Separate, store, protect, and handle at the site identified recyclable and salvageable waste products in order to prevent contamination of materials and to maximize recyclability and salvageability of identified materials. Refer to the Waste Management Requirements Plan specified under Section 01 74 19 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
- B. Return: Set aside and protect incorrectly delivered and substandard products and materials and return to supplier for credit.
- C. Recycling: Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials. Refer to the Waste Management Requirements and Plan specified under Section 01 74 19 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

**PART 2 - PRODUCTS** (Not Used)

**PART 3 - EXECUTION** (Not Used)

End of Section

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## **SECTION 017300 - EXECUTION**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section.

#### **1.2 SUMMARY**

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. General installation of products.
  - 4. Coordination of Owner-installed products.
  - 5. Progress cleaning.
  - 6. Starting and adjusting.
  - 7. Protection of installed construction.
  - 8. Correction of the Work.
- B. Related Sections include the following:
  - 1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
  - 2. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.

### **PART 2 - PRODUCTS (Not Used)**

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
  - 1. Before construction, verify the location and points of connection of utility services.
- B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect **and Owner's Project Manager** promptly.
- B. General: Engage a **professional engineer** to lay out the Work using accepted surveying practices.
  1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  3. Inform installers of lines and levels to which they must comply.
  4. Check the location, level and plumb, of every major element as the Work progresses.
  5. Notify Architect **and Owner's Project Manager** when deviations from required lines and levels exceed allowable tolerances.
  6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect **and Owner's Project Manager**.



3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect **or Owner's Project Manager**. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect **and Owner's Project Manager** before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of **two (2)** permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
  - 4. Maintain minimum headroom clearance of **10 feet** in spaces without a suspended ceiling.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

2. Allow for building movement, including thermal expansion and contraction.
  3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.6 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
  2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

### 3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
  3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
  2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

### 3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

### 3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.

- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

**END OF SECTION 017300**

## SECTION 017329 - CUTTING AND PATCHING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section.

#### 1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
  - 1. Divisions 02 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
  - 2. Division 07 Section "Penetration Firestopping" for patching fire-rated construction.

#### 1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
  - 1. Cutting round holes six (6) inches in diameter or less, or square or rectangular holes 8 x 8 inches or less, in existing assemblies is the work of the trade proposing using the hole or opening.
  - 2. Larger openings or holes shall be coordinated with the installer of the assembly being cut who shall cut, and reinforce or frame the opening or hole so that an effective patch can be made.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

#### 1.4 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
  - 1. Primary operational systems and equipment.
  - 2. Air or smoke barriers.

3. Fire-suppression systems.
  4. Mechanical systems piping and ducts.
  5. Control systems.
  6. Communication systems.
  7. Conveying systems.
  8. Electrical wiring systems.
  9. Operating systems of special construction in Division 13 Sections.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
1. Water, moisture, or vapor barriers.
  2. Membranes and flashings.
  3. Exterior curtain-wall construction.
  4. Equipment supports.
  5. Piping, ductwork, vessels, and equipment.
  6. Noise- and vibration-control elements and systems.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
  - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

### 3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete & Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.

5. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329





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SECTION 01 74 19  
CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.01 PROVISIONS INCLUDED

- A. The Conditions of the Contract and Division 1, General Requirements, apply to the work under this Section.
- B. Attention of the Contractor and this Subcontractor is drawn to provisions of the Contract Documents regarding the responsibility of all bidders to visit and inspect the site, including the existing building, and to base all bids on conclusions drawn from such inspections.

1.02 SCOPE OF WORK

- A. This Section specifies administrative and procedural requirements for the Contractor's implementation of waste management controls and systems for the duration of the Work.
  - 1. Masonry subcontractor is responsible for waste management of masonry work.
  - 2. Roofing and flashing subcontractor is to be responsible for waste management of roofing and flashing work.
- B. Develop and implement a waste management plan compliant with the requirements of LEED-S v4 MR prerequisite Construction and Demolition Waste Management Planning and MR credit Construction and Demolition Waste Management.

1.03 INTENT

- A. Sustainable Design Intent: Comply with project requirements intended to achieve certification, measured and documented according to the LEED v4 Green Building Rating System, of the US Green Building Council.
- B. The Owner and Architect have established that this Project shall generate the least amount of waste practical and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.
- C. Of the waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized to the greatest extent practical.
- D. With regard to these goals the Contractor shall develop, for the Architect's review, a Waste Management Plan for this Project.
  - 1. Each Subcontractor shall be responsible for segregating his own waste into different dumpsters as directed by the Contractor. OR C + D waste materials will be collected on site in commingled containers and sorted off site.
  - 2. Contractor shall be responsible for ensuring that debris will be disposed of at appropriately designated licensed solid waste disposal facilities, as defined by MGL Chapter 111, Section 150A.

#### 1.04 SUBMITTALS

A. Waste Management Plan: Within 21 calendar days after receipt of Notice to Proceed, the Contractor shall provide a compliant Construction Waste Management Plan including:

- Identify a minimum of five materials target for diversion, (structural and non-structural).
- Determine and document the estimated percentage of the overall waste that these materials represent. Divert 75% and Four Material Streams REQUIRED.
- Document if these materials will be site separated or commingled and sorted off site.
- Describe the diversion strategies.
- Identify the locations as to where the materials will be taken include recycling facilities, sorting facilities and landfills. Include the following:
  - Landfill Options: The name of the landfills where the non-recyclable Construction and Demolition waste will be taken to be disposed of, applicable tipping fees and the projected cost of disposing of the Project waste in landfills
  - Off-Site Sorting: The name of off site sorting facilities to receive commingled demolition and construction debris collected in mixed materials containers on site.
  - If sorted off site identify the sorting facilities and how the materials will be processed

NOTE: Alternative daily cover (ADC) does not qualify as material diverted from disposal. Land-clearing debris is not considered construction, demolition, or renovation waste that can contribute to waste diversion.

B. Landfill Certification: Provide a statement of verification that the landfills proposed for use are licensed for types of waste to be deposited and have sufficient capacity to receive the estimated waste from this project

C. For co-mingled materials collected in mixed containers on site and sorted off-site the following documentation must be provided:

1. For each container: A detailed breakdown of the weight of each material after sorting, including materials diverted to landfills
2. AND/OR Provide the sorting facilities annual average recycling rate for EACH facility where off-site sorting takes place. Additionally, provide documentation that the facility is State regulated.

NOTE: Co-mingled waste may be considered only one material stream unless the facility can provide diversion rates for specific materials.

D. Recycled, and Salvaged Materials: Provide a list of each materials proposed to be recycled, salvaged or diverted from landfill during the course of the Project. Include anticipated volumes for a minimum of five of the following and any additional items:

1. Cardboard and paper
  2. Clean dimensional Wood (free from nails and screws, etc)
  3. Concrete and slurry wall materials
  4. Brick/Masonry
  5. Asphalt
  6. Metals including framing, banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
  7. Gypsum Board
  8. Mechanical and Electrical equipment
  9. Building components that are removed intact during demolition
  10. Glass
  11. Packing materials
  12. Beverage Containers
- E. Meetings: A description of the regular meetings to be held to address waste management
- F. Procedures for Materials Handling: Provide a description of the means by which any waste materials and/or collection containers identified above will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
- G. Transportation: Provide a description of the means of transportation of the recyclable materials identify if materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site for off-site sorting
- H. Waste Management Progress Reports to be submitted concurrent with each monthly Application for Payment. Provide a written Waste Management Progress Report and updated tracking spreadsheet
- I. Waste Management Final Report: Prior to Substantial Completion, submit a written Waste Management Final Report summarizing the types and quantities of materials recycled and disposed of under the Waste Management Plan. Include the name and location of disposal facilities. Quantity may be measured by either weight or volume; be consistent in calculations. Include the following:
1. Material category.
  2. Generation point of waste.
  3. Total quantity of waste, by weight.
  4. Quantity of waste salvaged, both estimated and actual.
  5. Quantity of waste recycled, both estimated and actual.
  6. Total quantity of waste recovered (salvaged plus recycled).
  7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- J. Other Submittals:
1. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

2. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
3. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
4. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

#### 1.05 CONTRACTORS

- A. Contractor may subcontract work of this Section to a sub-contractor specializing in recycling and salvaging of construction waste.
  1. Institution Recycling Network, 7 South State Street, Suite 2, Concord, NH 03301; tel. 866-229-1962
  2. Waste Solutions, Inc., 965 Plain Street, Marshfield, MA 02050; tel. 781-844-1476
  3. Eco-One Solutions, 18 Glenwood Street, Natick MA, 01760; tel. 978.270.8950
  4. Or equal as approved by the Architect.
- B. Gypsum Wallboard Recycling: New, paper-faced gypsum wallboard scrap (cuts from construction - not demolition waste) generated at project shall be recycled by Gypsum Recycling America, LLC. Keep scrap dry. Contact Gypsum Recycling America at 1.866.9.GYPSUM (1.866.949.7786) or [jw@gypsumrecycling.us](mailto:jw@gypsumrecycling.us), to coordinate recycling efforts.
- C. Acoustical Ceiling Panel Recycling: Demolition and construction waste pulpable mineral fiber ceiling panels may be recycled by Armstrong World Industries. Contact Armstrong at 1-877-ARMSTRONG (1-877-276-7876) or visit [www.armstrong.com](http://www.armstrong.com) to coordinate recycling efforts, apply for product approvals, and receive reclamation procedure requirements.

#### PART 2 - PRODUCTS

Not Used.

#### PART 3 - EXECUTION

##### 3.01 RECYCLING

- A. Metal, including but not limited to aluminum stairs, structural beams and sections, and reinforcing steel shall be recycled.
- B. Wood that is not painted and does not contain preservatives (i.e. creosote, arsenic, and chromium-containing preservatives) shall be segregated and recycled.
- C. Refer to the Massachusetts Recycling Directory available at the Massachusetts State Bookstore (617-727-2834) in the State Capitol Building for recycling operations within the State.

### 3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: The Contractor shall designate an on-site person responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project
- B. Distribution: The Contractor shall distribute copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, the Owner and the Architect.
- C. Instruction: The Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project
- D. Separation Facilities: The Contractor shall lay out and label a specific area to facilitate separation of materials for recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials. Location shall be acceptable to the Architect.
- E. Hazardous Wastes: Any unforeseen hazardous wastes shall be separated, stored, and disposed of according to local regulations and as directed by the Owner.

END OF SECTION 01 74 19

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Section 01 75 00  
STARTING AND ADJUSTING

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Testing, adjusting, and balancing.
- B. Operation, maintenance, and service.

1.2 RELATED REQUIREMENTS

- A. Section 01 91 13 – GENERAL COMMISSIONING REQUIREMENTS.

1.3 TESTING, ADJUSTING, AND BALANCING

- A. General: Adjust operating products and equipment to ensure smooth and unhindered operation.
  - 1. Construction Manager is advised that testing and balancing agents may be required during commissioning activities as specified in Section 01 91 13 – GENERAL COMMISSIONING REQUIREMENTS, or as may be additionally directed by Architect.
- B. Trade Contractors under Division 21 – Fire Suppression, Division 22 – Plumbing and Division 23 – Heating, Ventilating and Air Conditioning are all responsible for primary system testing and balancing as specified under their respective Sections. Construction Manager will be required to coordinate these services.
- C. Construction Manager and Trade Contractors (Division 21 – Fire Suppression, Division 22 – Plumbing and Division 23 – Heating, Ventilating and Air Conditioning) are jointly responsible and required to provide assistance to the Owner's independent Commissioning agent as specified under Section 01 91 00 – GENERAL COMMISSIONING.
- D. The independent firm will perform services specified under Division 21 - Fire Suppression, Division 22 - Plumbing, and Division 23 - Heating, Ventilating, and Air Conditioning.
- E. Reports will be submitted by the independent firm to the Architect indicating observations and results of tests and indicating compliance or non-compliance with specified requirements and with the requirements of the Contract Documents.

1.4 AIR QUALITY TESTING

- A. Air quality testing: The Owner reserves the right to employ the services of an independent testing agency to perform air quality testing. Testing will occur prior to Construction Manager's request for inspection for Substantial Completion. The intent of testing is to certify that the building is "Clear" of airborne contaminants.

1.5 OPERATION, MAINTENANCE, AND SERVICE

- A. Coordinate schedule for start-up of various equipment and systems.

- B. Notify Architect/Engineer and Owner 7 days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage.
- D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of responsible Construction Managers' personnel in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report in accordance with Section 01 77 00 - CLOSEOUT PROCEDURES that equipment or system has been properly installed and is functioning correctly.

**PART 2 - PRODUCTS** (Not Used)

**PART 3 - EXECUTION** (Not Used)

End of Section

## **SECTION 017700 - CLOSEOUT PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section.

#### **1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Inspection procedures.
  - 2. Warranties.
  - 3. Final cleaning.
- B. Related Sections include the following:
  - 1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
  - 2. Division 01 Section "Execution" for progress cleaning of Project site.
  - 3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 5. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
  - 6. Division 01 Section "General Commissioning Requirements" for requirements for Commissioning Plan.
  - 7. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

#### **1.3 SUBSTANTIAL COMPLETION**

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
  - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete. Provide punch list on an Excel spreadsheet.

2. Advise Owner of pending insurance changeover requirements.
  3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  5. Prepare and submit Project Record Documents.
  6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Advise Owner of changeover in heat and other utilities.
  10. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  11. Complete final cleaning requirements, including touchup painting.
  12. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect, and Owner's Project Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for Final Completion.

#### **1.4 FINAL COMPLETION**

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
  2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect and Owner's Project Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

### **1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)**

- A. Preparation: Submit six 6 copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor then roof.
  2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Architect and Owner's Project Manager.
    - d. Name of Contractor.
    - e. Page number.

### **1.6 WARRANTIES**

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8- 1/2-by-11-inch paper.
  2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed

- description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## **PART 3 - EXECUTION**

### **3.1 FINAL CLEANING**

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid

- disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
  - h. Sweep concrete floors broom clean in unoccupied spaces.
  - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
  - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
  - k. Remove labels that are not permanent.
  - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
  - m. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - n. Replace parts subject to unusual operating conditions.
  - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
  - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
  - s. Leave Project clean and ready for occupancy.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

**END OF SECTION 017700**

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Section 01 78 00  
CLOSEOUT SUBMITTALS

**PART 1 - GENERAL**

1.1 SECTION INCLUDES

- A. Project Record Documents.
- B. Record Project Manual.
- C. Project Record Drawings (As built drawings).
- D. Project Record Submittals.
- E. Final Site Survey.
- F. Operation and maintenance data, preventive maintenance instructions.
- G. Materials and finishes manual.
- H. Maintenance contracts.
- I. Spare parts and maintenance materials.

1.2 RELATED REQUIREMENTS

- A. Section 01 31 00 - PROJECT MANAGEMENT AND COORDINATION:
  - 1. Coordination Drawing Requirements.
  - 2. Electronic file requirements for base sheets to prepare Project Record Drawings (As-built drawings).
- B. Section 01 33 29 - SUSTAINABLE DESIGN REPORTING: Special administrative and procedure requirements related to the Owner's *LEED v4, LEED for Building Design and Construction, LEED BD+C: Schools* rating system certificate goals of energy conservation and efficiency, indoor air quality, and natural resource efficiency.
- C. Section 01 60 00 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
- D. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
- E. Section 01 78 36 – WARRANTIES: Administrative and procedural requirements for warranties, guarantees and bonds.

1.3 PROJECT RECORD DOCUMENTS

- A. General: Record documents shall reflect actual "as-built" condition and the products installed. Include all changes and deviations from original Contract Documents, and incorporate information from:
  - 1. Original Contract Documents.
  - 2. Addenda.

3. Change orders.
  4. Construction change directives.
  5. Field directives, and instructions from the Owner, Architect or regulatory authorities having jurisdiction.
- B. Project Record Documents include, but are not limited to:
1. Record Project Manual.
  2. Project record drawings (as built drawings).
  3. Project record submittals.
  4. Final Site Survey.
  5. Operation and maintenance data, preventive maintenance instructions.
  6. Materials and finishes manual.
  7. Product warranties and bonds.
  8. Maintenance contracts.
  9. Record of all test reports and inspections.
  10. Wall charts and data such as valve diagrams, electrical panel board directories, and similar information.
  11. Organized, complete testing results for the entire project as submitted to the City of Worcester Building Department
- C. Labeling and identification of Record Documents
1. Clearly label all record documents with name of Project and the words "Record Document".
  2. Date progressive entries of information as appropriate.
  3. Date Record Documents with the final submission date.
  4. All electronic records shall be similarly organized.

#### 1.4 SUBMITTAL QUANTITY REQUIREMENTS

- A. Furnish Architect with the following quantities of each submittal:
1. Record Project Manual: 3 bound copies and 5 electronic versions.
  2. Project Record Drawings (as-builts):
    - a. 5 sets of Drawings in Autodesk Revit®, Autodesk AutoCad® and Portable Document Format (PDF) format. Verify release version and disc type with Owner prior to submittal.
    - b. 3 "blackline print" sets of Drawings.
  3. Project Record Submittals: Provide a DVD or portable media including USB flash drive with all submittals arranged into Divisions, specification sections, and submittal titles.
  4. Final Site Survey: 5 copies.
  5. Operation and maintenance data, preventive maintenance instructions: 3 bound copies and 5 electronic versions.
  6. Owner Training Video for operation of building systems and major equipment: 5 copies.

7. Materials and finishes manual: 3 bound copies and 5 electronic versions.
8. Product warranties and bonds: 3 bound copies and 5 electronic versions.
9. Maintenance contracts: 3 bound copies and 5 electronic versions.
10. Record of all test reports and inspections including code sign off drawings and permits: 3 bound copies and 5 electronic versions.

#### 1.5 RECORD PROJECT MANUAL

- A. The Construction Manager is responsible to maintain a Project Manual reflecting revisions and changes to the Original Issue Project Manual.
  1. Clearly label the Record Project Manual as "Record Document Specifications, in a three ring binder.
  2. Do not use Record Project Manual for construction purposes; protect from loss in a secure location.
  3. Record all variations and deviations to the Contract Documents, including changes made by Addenda, Bulletin, Change Order, Change Directive and other modifications to the Contract..
    - a. Cut and paste revisions into their applicable specification section.
    - b. Identify all changes with cross-reference to appropriate Addendum Number, Modification Number, Change Order Number etc.
  4. In each individual Specification Section, under "*Part 2 – Products*", identify all manufacturers and products which are actually used as part of the Work.
  5. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
- B. Record Project Manual: Provide prior to request for Final Acceptance.
  1. Manuals shall be in 8-1/2 by 11 inch pages and bound in 3-ring (D-shape) binders with durable plastic covers. Internally subdivide the binder contents by Division with permanent page dividers.
  2. Label front cover and spine of each binder with laser printed titles, dates, and project information.
  3. All information from "in-progress" manual shall be clearly and completely transferred.
  4. Pages shall be undamaged.
  5. Provide 3 bound copies and 5 electronic versions on media acceptable to the City of Worcester.

#### 1.6 PROJECT RECORD DRAWINGS

- A. The Construction Manager is responsible to maintain a clean, undamaged set of blue or black line prints of Contract Drawings and shop drawings for preparing the record drawings.
  1. Where shop drawings are used, record a cross-reference at the corresponding location on the Contract Documents.
  2. Site Drawings maintained by the Construction Manager and all trades, the coordination drawings file, and other field documents shall be used in preparing the electronic as-built drawings and documents.

3. Construction Manager to compile all trade sets to one organized final file/submission.
- B. Do not use Record Documents for construction purposes; protect from loss in a secure location. Mark-up these drawings to show clearly and completely the actual installation reflecting all changes made in the Work during construction.
  1. Mark whichever drawing is most capable of showing conditions accurately.
  2. Record all variations and deviations to the Contract Documents, including changes made to schedules, details, and all architectural changes to structure, exterior enclosure, interior partitions and ceilings.
  3. Record new information that is important to the Owner, but was not shown on the Contract Drawings or shop drawings.
  4. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
- C. The food service, fire protection, plumbing, mechanical and electrical trades shall be responsible to the Construction Manager to keep the record documents for their portions of the work marked currently to record all changes in the mechanical and electrical work made during construction.
- D. The Architect may periodically inspect these record drawings, and their proper maintenance may be a condition precedent to approval of applications for periodic payments.
- E. Deliver all Project Record Documents, shop drawings, product data, and samples to the Architect for the Owner's use, upon completion of the Work and prior to request for Final Acceptance of the Work.
- F. In addition at the completion of the work, the Construction Manager is responsible for the preparation and submittal of neat, clean well drafted, and complete record drawings, at no additional costs to the Owner. These reproducible Project Record Documents shall be transmitted to the Architect as a condition precedent to final payment, and include documents prepared by the food service, fire protection, plumbing, mechanical and electrical trades.

#### 1.7 FINAL SITE SURVEY

- A. Under provisions of Section 01 73 00 - EXECUTION, Surveyor shall provide final corrected submission of Final Site Survey (As-built property survey) after work has been completed.
  1. Final site survey shall show significant features for the Project. Include a certification, signed by the surveyor, to the effect that metes, bounds, lines and levels of the Project are accurately positioned as shown on the survey.
- B. Survey format shall be in accordance with requirements of the authorities having jurisdiction, and show the following as a minimum:
  1. Property boundaries.
  2. All required legal descriptions.
  3. Bench marks.
  4. Completed foundation work.

5. Building extremities.
  6. Pad mounted equipment.
  7. All paving work.
  8. Revisions to wetland areas.
  9. Easements and modifications to easements.
  10. Underground utilities and all changes in existing utilities.
- C. Record deviations from required lines and levels. Advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Final Site Survey, record deviations that are accepted and not corrected.
- D. Submit signed, sealed and certified copies shall be provided to the architect's office for review prior to filing with authorities having jurisdiction. Ensure information is complete, accurate submitted in a timely fashion.
1. Recording: At Substantial Completion, have the final survey recorded by or with local authorities as the official "Property Survey".

#### 1.8 OPERATION AND MAINTENANCE MANUALS

- A. General: Coordinate content and submission requirements of operation and maintenance manuals with Owner's Commissioning Agent.
- B. Prepare data in the form of an instructional manual. Furnish separate manuals for each of the following groups of equipment:
1. Food service equipment.
  2. Elevators.
  3. Special equipment and systems.
  4. Fire protection system.
  5. Utilities and plumbing systems.
  6. Heating, ventilation and air conditioning system.
  7. Electrical systems.
- C. Furnish bound and properly identified Manuals prior to request for Final Acceptance.
1. Manuals shall be in 8-1/2 by 11 inch pages and bound in three "D ring" capacity binders with durable plastic covers. Internally subdivide the binder contents with permanent page dividers.
    - a. Arrange content by section number and systems, process flow, under section numbers and sequence as listed in the Table of Contents of this Project Manual.
    - b. Drawings: Preferable 11 inches in height bound in with text with reinforced punched binder tab. Fold drawings larger than 8-1/2 by 11 inches to size of text pages. Provide a drawing pocket for Drawings larger than 11 by 17 inches; locate pocket inside rear cover or bound in with text.
  2. Each manual shall include the same following minimum information:
    - a. Table of Contents.

- b. Directory of Construction Manager, Trade Contractors, subcontractors, and major equipment supplies listing addresses, phone numbers and appropriate emergency phone numbers.
      - 1) Include local sources of supplies and replacement parts.
    - c. Directory of Architect and consultants listing addresses and phone numbers.
    - d. Operation and maintenance instructions. Provide schematic diagrams of control systems, circuit directories for each electric panel and charts showing the tagging of all valves.
    - e. Air and water test and balancing reports.
    - f. Maintenance and cleaning instructions for finishes.
    - g. Product and manufacturer's Certificates.
    - h. Photocopies of all extended warranties and bonds.
  - 3. Submit one copy of completed volume in final form 21 days prior to Final Inspection. This copy will be returned after final inspection with Architect's comments; Revise and submit all volumes to Owner.
- D. For each item of equipment, include description of equipment, component parts and accessories. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts. Additionally provide the following for each item:
- 1. Panelboard circuit directories: Provide electrical service characteristics, controls and communications.
  - 2. Include color coded wiring diagrams as installed.
  - 3. Operating procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
  - 4. Maintenance requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and re-assembly instructions; alignment, adjusting, balancing, and checking instructions.
    - a. Maintenance drawings: Supplement product data to illustrate relation of component parts of equipment and systems, to show control and flow diagrams. Do not use project Record Documents as maintenance drawings.
  - 5. Provide servicing and lubrication schedule, and list of lubricants required.
  - 6. Include manufacturer's printed operation and maintenance instructions.
  - 7. Include sequence of operation by controls manufacturer.
  - 8. Provide control diagrams by controls manufacturer as installed.
  - 9. Provide Construction Manager's coordination drawings, with color coded piping diagrams as installed.
  - 10. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
  - 11. Provide original manufacturer's parts (OEM) list, illustrations assembly drawings, and diagrams required for maintenance.

- a. Provide list of original manufacturer's spare parts (OEM), current prices, and recommended quantities to be maintained in storage.
  - b. Include local source of supplies and replacement parts, and any other data pertinent for procurement procedures.
12. Additional requirements: As specified in individual specification Sections.

E. Standards:

1. Measurements: Provide all measurements in U.S. standard units such as feet and inches, pounds, and cfm; provide additional measurements in the "International System of Units" (SI).
2. Abbreviations: Provide complete nomenclature of all parts of all equipment; include part numbers of all replaceable parts.

1.9 MATERIALS AND FINISHES MANUAL

A. Furnish bound and properly identified manuals for all materials and finishes prior to request for Substantial Completion review.

1. Manuals shall be in 8-1/2 by 11 inch pages and bound in three "D ring" capacity binders with durable plastic covers. Internally subdivide the binder contents with permanent page dividers and logically organized.
2. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.
  - a. Arrange content by section number and systems, process flow, under section numbers and sequence as listed in the Table of Contents of this Project Manual.
  - b. Drawings: Preferable 11 inches in height bound in with text with reinforced punched binder tab. Fold drawings larger than 8-1/2 by 11 inches to size of text pages. Provide a drawing pocket for Drawings larger than 11 by 17 inches larger drawings; locate pocket inside rear cover or bound in with text.

B. Manuals shall include the following:

1. Product data, with catalog number, size, composition, and color and texture designations for all building products, applied materials, and finishes. Provide information for re-ordering custom manufactured products.
2. Instructions for care and maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
3. Moisture protection and weather exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
4. Additional requirements: As specified in individual specification Sections.

1.10 PEST CONTROL INSPECTION AND REPORT

- A. Engage an experienced, licensed exterminator to make a final inspection and fully rid Project of rodents, insects, and other pests.

1. Prepare and submit report, identify:
  - a. Area or areas which were treated.
  - b. Rodenticides used.
  - c. Manufacturer's data including MSDS, special precautions and applications instructions.
  - d. Pollution preventive measures employed.

1.11 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.
- B. Deliver materials to on-site location designated by the Owner; obtain receipt.

**PART 2 - PRODUCTS** (Not Used)

**PART 3 - EXECUTION** (Not Used)

End of Section



## **SECTION 017823 - OPERATION AND MAINTENANCE DATA**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section..

#### **1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems, and equipment.
  - 4. Maintenance manuals for the care and maintenance of products, materials, and finishes, and systems and equipment.
- B. Related Sections include the following:
  - 1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  - 2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
  - 3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
  - 4. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

#### **1.3 DEFINITIONS**

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

#### **1.4 SUBMITTALS**

- A. Initial Submittal: Submit four (4) draft copies of each manual at least fourteen (14) days before requesting inspection for Substantial Completion. Include a complete

operation and maintenance directory. Architect will return one (1) copy of draft and mark whether general scope and content of manual are acceptable.

- B. Final Submittal: Submit four (4) copies of each manual in final form at least (14) days before final inspection. Architect will return copy with comments within (14) days after final inspection.
  - 1. Correct or modify each manual to comply with Architect's comments. Submit six (6) copies of each corrected manual within (14) days of receipt of Architect's comments.

## **1.5 COORDINATION**

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

## **PART 2 - PRODUCTS**

### **2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY**

- A. Organization: Include a section in the directory for each of the following:
  - 1. List of documents.
  - 2. List of systems.
  - 3. List of equipment.
  - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

### **2.2 MANUALS, GENERAL**

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name, address, and telephone number of Contractor.
  - 6. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
  - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
  - 1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
  - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
  - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
  - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## **2.3 EMERGENCY MANUALS**

- A. Content: Organize manual into a separate section for each of the following:
  1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  1. Fire.
  2. Flood (internal spaces).
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
  1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.
  4. Required sequences for electric or electronic systems.
  5. Special operating instructions and procedures.

## **2.4 OPERATION MANUALS**

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions.
  2. Operating standards.
  3. Operating procedures.
  4. Operating logs.
  5. Wiring diagrams.
  6. Control diagrams.
  7. Piped system diagrams.
  8. Precautions against improper use.
  9. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
1. Product name and model number.
  2. Manufacturer's name.
  3. Equipment identification with serial number of each component.
  4. Equipment function.
  5. Operating characteristics.
  6. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
  2. Equipment or system break-in procedures.
  3. Routine and normal operating instructions.
  4. Regulation and control procedures.
  5. Instructions on stopping.
  6. Normal shutdown instructions.
  7. Seasonal and weekend operating instructions.
  8. Required sequences for electric or electronic systems.
  9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## **2.5 PRODUCT MAINTENANCE MANUAL**

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

## **2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL**

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard printed maintenance instructions and bulletins.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  3. Identification and nomenclature of parts and components.
  4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
  2. Troubleshooting guide.
  3. Precautions against improper maintenance.
  4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

## **PART 3 - EXECUTION**

### **3.1 MANUAL PREPARATION**

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
  - 2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."
- G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

**END OF SECTION 017823**



Section 01 78 36  
WARRANTIES

**PART 1 - GENERAL**

1.1 SUMMARY

- A. General: This Section specifies general administrative and procedural requirements for warranties, guarantees and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties. Warranty, Guarantee and Bond requirements of this Section are applicable to all trades, all Divisions of the Specifications, and applies to all Work performed under this Contract.
  - 1. Warranties required under the Contract are in addition to and not in lieu of any remedy or warranty to which the Owner is entitled under law.
  - 2. Warranties required under the Contract are not a waiver of Owner's legal rights.
- B. Construction Manager's Procurement Obligations: Do not purchase, subcontract for, or allow others to purchase or sub-subcontract for material or units of work for project where a special project warranty, certification or similar commitment is required, until it has been determined that entities required to countersign such commitments are willing to do so.

1.2 RELATED REQUIREMENTS

- A. General provisions of the Contract, including General and Supplementary Conditions apply to this Section.
- B. Individual Specification Sections contain additional specific requirements for warranties and bonds.
- C. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

1.3 DISCLAIMERS AND LIMITATIONS

- A. General Limitations: It is recognized that specific warranties are intended primarily to protect Owner against failure of the work to perform as required, and against deficient, defective, and faulty materials and workmanship, regardless of sources.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Construction Manager of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers, Trade Contractors and subcontractors required to countersign special warranties with the Construction Manager.
  - 1. Pro-rating of warranties: Except where explicitly specified otherwise, each warranty issued shall cover the full cost of warranty-related repairs throughout the full term of the warranty.

#### 1.4 DEFINITIONS

- A. Categories of Specific Warranties: Warranties on the work are in several categories, including those of General Conditions, and including (but not necessarily limited to) the following specific categories related to individual units of work specified in sections of Divisions 2 through 50 of these Specifications:
1. Construction Manager's Comprehensive Warranty: The Construction Manager shall provide a comprehensive one-year warranty covering all labor, materials, equipment and work related to the entire Contract, and shall promptly repair or replace defective and deficient work.
  2. Special Project Warranty (Guaranty): A warranty specifically written and signed by Construction Manager for a defined portion of the work; and, where required, countersigned by Trade Contractor or subcontractor, installer, manufacturer or other entity engaged by Construction Manager. Special Warranties extend time limits provided by standard warranties or to provide greater rights for the Owner.
  3. Specified Product Warranty: A warranty which is required by Contract Documents, to be provided for a manufactured product incorporated into the work; regardless of whether manufacturer has published a similar warranty without regard for specific incorporation of product into the work, or has written and executed a special project warranty as a direct result of Contract Document requirements.
    - a. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
  4. Coincidental Product Warranty: A warranty not specifically required by Contract Documents (other than as specified in this Section), but which is available on a product incorporated into the work, by virtue of the fact that manufacturer or product has published warranty in connection with purchases and use of product without regard for specific applications except as otherwise limited by terms of warranty.

#### 1.5 WARRANTY REQUIREMENTS

- A. Warranty Period Commencement Date: Effective stating date for Warranty periods is the Date of Substantial Completion for Project.
1. Equipment and systems start-up, operation and use, occurring prior to Project Substantial Completion, will not be considered commencement of warranty period under any terms of this Contract.
  2. Exceptions: Starting dates for warranties prior to the Project Date of Substantial Completion are not permitted, except for the two conditions below:
    - a. Warranty requirements specified in individual specification sections explicitly specify that a required warranty or guarantee shall be effective on date of shipment, date of manufacturer, or date of installation.
    - b. Warranties for Incomplete work: The effective date for warranty of work which has not been completed prior to the Date of Substantial Completion, shall be effective on the date of Final Completion and Owner's acceptance of the Work.

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- B. Related Damages and Losses: In connection with Construction Manager's correction of warranted work which has failed, remove and replace other work of project which has been damaged as a result of such failure, or must be removed and replaced to provide access for correction of warranted work.
1. Consequential Damages: Except as otherwise indicated or required by governing regulations, special project warranties and product warranties are not extended to cover damage to building contents (other than work of Contract) which occurs as a result of failure of warranted work.
- C. Reinstatement of Warranty Period: Except as otherwise indicated, when work covered by a special project warranty or product warranty has failed and has been corrected by replacement or restoration, reinstate warranty by written endorsement starting on date of acceptance of replaced or restored work.
1. Reinstated warranty value: The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
  2. Reinstated warranty period: A period of time ending upon date original warranty would have expired, if there had been no failure, but not less than half of original warranty period of time.
- D. Warranties are Irrevocable: Warranties issued to the Owner are irrevocable.
1. Non-Payment: If warrantor refuses to issue warranty, or attempts to revoke warranty due to lack of payment by any party other than the Owner, the Construction Manager shall resolve the payment conflict, and cause the warranty to be issued or reinstated.
  2. Incomplete or incorrect Installation: If warrantor refuses to issue warranty, or attempts to revoke warranty due to improper installation or other deficiency, the Construction Manager shall correct the deficiency and cause the warranty to be issued or reinstated.
- E. Transferable Warranties: All warranties shall permit Owner to transfer or assign warranties to future owners or other assignors at no additional cost to the Owner for the full warranty period.
- F. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. The Construction Manager is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the work through a portion of its anticipated useful service life.
1. Work repairs or replaced under warranty shall be warranted for the full duration of the original warranty.
- G. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- H. Rejection of Warranties:
1. Owner reserves the right, at time of substantial completion or thereafter, to reject coincidental product warranties submitted by Construction Manager,

which in opinion of Owner tend to detract from or confuse interpretation of requirements of Contract Documents.

2. Owner reserves the right to reject warranties and to limit selection to products with warranties which are not in conflict with the requirements of the Contract Documents.

- I. Owner's right to refuse Work: The Owner reserves the right to refuse to accept work for the project where a special warranty, certification, or similar commitment is required on such work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.

#### 1.6 COMPREHENSIVE WARRANTY

- A. Comprehensive Warranty: In addition to all other warranties, the Construction Manager shall issue a Comprehensive Total Contract Warranty which shall include all work of this Contract, without limitation including consequential damages.
  1. Duration of Comprehensive Warranty: One full year from date of Substantial Completion.
  2. Consequential damages: Warranty includes consequential damages which relate to a warranty claim, these include without limitation:
    - a. All costs required to uncover and repair all work related to warranty claim.
    - b. All costs relating to repair and restoration of damaged property, resulting from warranty claim.
    - c. All costs resulting from failure to conform to the Contract Documents, and for required rebuilding, construction or reconstruction to correct work.
    - d. Perform to the satisfaction of the Owner all repairs, reconstruction, and restoration to original condition of adjacent and related work affected by damage under a warranty claim.
- B. Warranty Claims: Owner will notify Construction Manager in writing of each warranty claim. Warranty repairs shall be completed within 30 days of written notice, except as pre-approved by Owner.
  1. In the event of an emergency condition, where in the reasonable opinion of the Owner an immediate repair under warranty is necessary, warranty repairs shall be completed within 14 calendar days from date of notice.
  2. Owner's right to correct: In the event the Construction Manager fails to respond to a warranty claim within the specified time limits, the Owner reserves the right to make the necessary corrections or repairs and recover all costs and expenses from the Construction Manager.
- C. Construction Manager's responsibilities under Comprehensive Warranty:
  1. Notify in writing each affected warrantor and original Trade Contractor, subcontractor, installer, vendor as appropriate to the warranty claim.
  2. Manage the warranty claim for the Owner.
  3. Assist the Owner in obtaining warranty satisfaction.
  4. Arrange and manage all warranty related work including work relating to consequential damages.

1.7 SUBMITTALS

- A. Submit written warranties to the Owner prior to the date certified for Substantial Completion. In compliance with requirements specified under Section 01 77 00 – CLOSEOUT PROCEDURES and Section 01 78 00 – CLOSEOUT SUBMITTALS.
  - 1. When a designated portion of the Work is completed and occupied, or used by the Owner by separate agreement with the Construction Manager during the construction period, submit properly executed warranties to the Owner within 14 calendar days of completion of the designated portion of Work.
  - 2. Refer to individual section of Divisions 2 through 50 for the determination of units of work which are required to be specifically or individually warranted, and for the specific requirements and terms of those warranties (or guarantees).
  - 3. Specific Warranty Forms: Where a special project warranty (guaranty) or specified product warranty is required to be executed, prepare a written document to contain terms and appropriate identification, ready for execution by all required parties (including manufacturers, vendors, Trade Contractors and subcontractors). Submit draft to Owner (through Architect) for approval prior to final executions.
- B. Form of Submittal: At Final Completion, compile three (3) copies of each required warranty and bond properly executed by the Construction Manager, or by the Construction Manager, Trade Contractors, subcontractor, supplier or manufacturer. Organize the warranty documents into an orderly sequence based on the Table of Contents of the Project Manual.
  - 1. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.
  - 2. Provide heavy paper dividers with celluloid-covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
  - 3. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the project title or name, and the name of the Construction Manager.
  - 4. When operating and manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 – EXECUTION**

3.1 SCHEDULE

- A. Provide warranties on products and installations as specified in individual specification Sections in Divisions 2 through 50 of the Project Manual.

End of Section

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## **SECTION 017839 - PROJECT RECORD DOCUMENTS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section.

#### **1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. As-Built Record Drawings.
  - 2. Contractor's Record Drawings.
- B. Related Sections include the following:
  - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
  - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 3. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

#### **1.3 SUBMITTALS**

- A. As-Built Record Drawings:
  - 1. Submit copies of As-Built Record Drawings as follows:
    - a. Initial Submittal: Submit one (1) set of plots on bond paper from corrected Record CAD Drawings. Architect will initial, and date each plot and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return plots for preparation of the final submittal.
    - b. Mylar and Paper Final Submittals: Submit two (2) sets of corrected Record CAD Drawings plotted in permanent ink on 30" x 42" .004" thick single matte Mylar drafting film, and five (5) sets plotted in permanent ink on 30" x 42" .004" thick, acid free 24 lb. bond with opacity 88%, whiteness 96, brightness 94%, smoothness 80. Print each Drawing, whether or not changes or additional information were recorded.

- c. Electronic Final Submittal: Provide six (6) set(s) of DVDs each to have a Table of Contents file to AutoRun on insertion in a PC's DVD drive. Table of Contents shall be in html with drawing number, drawing title, and description of contents, hyperlinked to the AutoCad v. 2007 drawing files.

## **PART 2 - PRODUCTS**

### **2.1 CONTRACTOR'S RECORD DRAWINGS RECORD PRINTS:**

- A. Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
  - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an understandable drawing technique.
    - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
  - 2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below floor slabs.
    - d. Locations and depths below floor slabs-on-grade of underground utilities.
    - e. Locations and depths below floor slabs-on-grade of electrical conduits, waste piping, sewer, roof drains, and sub-soil drains, and radon venting piping.
    - f. Revisions to routing of piping and conduits.
    - g. Revisions to electrical circuitry.
    - h. Actual equipment locations.
    - i. Duct size and routing.
    - j. Locations of concealed internal utilities.
    - k. Changes made by Change Order or Construction Change Directive.
    - l. Changes made following Architect's written orders.
    - m. Details not on the original Contract Drawings.
    - n. Field records for variable and concealed conditions.
    - o. Record information on the Work that is shown only schematically.
  - 3. Mark the Contract Drawings, Coordination Drawings, or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and



- accurately. If Coordination or Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. As-Built Record CAD Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect, and Owner's Project Manager, and School Plant Manager. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:
1. Format: Same CAD program, version, and operating system as the original Contract Drawings.
  2. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
  3. Refer instances of uncertainty to Architect, and or Owner's Project Manager for resolution.
  4. Architect will furnish Contractor one set of CAD Drawings of the Contract Drawings for use in recording information.
    - a. Architect makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.
    - b. The Contract Drawings are available in AutoCad and in one or more of the following versions: v 2000, v 2004, and v 2007. Contractor should convert files to v. 2007 as soon as he receives the files.
- C. Newly Prepared Record Drawings:
1. New Drawings shall be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification in response to an RFP.
  2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into As-Built Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- D. Identify and date each Record Drawing; include the designation "PROJECT AS-BUILT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
3. Identification: As follows:
  - a. Project name.
  - b. Date.
  - c. Designation "PROJECT AS-BUILT RECORD DRAWINGS."
  - d. Name of Architect.
  - e. Name of Contractor.

## **2.2 AS-BUILT RECORD SPECIFICATIONS**

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the identifying number of the approved submission, or proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

## **2.3 RECORD PRODUCT DATA**

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

## **2.4 MISCELLANEOUS RECORD SUBMITTALS**

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

## **PART 3 - EXECUTION**

### **3.1 RECORDING AND MAINTENANCE**

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's, and Owner's Project Manager's reference during normal working hours.

**END OF SECTION 017839**

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## **SECTION 017900 - DEMONSTRATION AND TRAINING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section.

#### **1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
  - 3. Demonstration and training videotapes.
- B. Related Sections include the following:
  - 1. Division 01 Section "Project Management and Coordination" for requirements for preinstruction conferences.
  - 2. Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

#### **1.3 SUBMITTALS**

- A. Instruction Program: Submit six (6) copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. At completion of training, submit six (6) complete training manual(s) for Owner's use.
- B. Qualification Data: For facilitator, instructor, and photographer.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

- E. Demonstration and Training DVDs: Submit two (2) copies within seven (7) days of end of each training module.
1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.
    - b. Name and address of photographer.
    - c. Name of Architect and Construction Manager.
    - d. Name of Contractor.
    - e. Date videotape was recorded.
    - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
  2. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

#### **1.4 QUALITY ASSURANCE**

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
1. Inspect and discuss locations and other facilities required for instruction.
  2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  3. Review required content of instruction.
  4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

## **1.5 COORDINATION**

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

## **PART 2 - PRODUCTS**

### **2.1 INSTRUCTION PROGRAM**

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
  - 1. Motorized doors, including overhead coiling doors, overhead coiling grilles, and automatic entrance doors.
  - 2. Equipment, including stage equipment, projection screens, waste compactors, food-service equipment, residential appliances, and laboratory fume hoods.
  - 3. Fire-protection systems, including fire alarm, fire pumps, and fire-extinguishing systems.
  - 4. Intrusion detection systems.
  - 5. Conveying systems, including elevators and wheelchair lifts.
  - 6. Laboratory equipment, including laboratory air and vacuum equipment and piping.
  - 7. Heat generation, including boilers, feedwater equipment, pumps, and water distribution piping.
  - 8. Refrigeration systems, including chillers, cooling towers, condensers, pumps, and distribution piping.
  - 9. HVAC systems, including air-handling equipment, air distribution systems, and terminal equipment and devices.
  - 10. HVAC instrumentation and controls.
  - 11. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
  - 12. Packaged engine generators, including transfer switches.
  - 13. Lighting equipment and controls.
  - 14. Communication systems, including intercommunication, surveillance, clocks and programming, voice and data, and television equipment.

- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Operations manuals.
    - c. Maintenance manuals.
    - d. Project Record Documents.
    - e. Identification systems.
    - f. Warranties and bonds.
    - g. Maintenance service agreements and similar continuing commitments.
  3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.
    - d. Operating instructions for conditions outside of normal operating limits.
    - e. Sequences for electric or electronic systems.
    - f. Special operating instructions and procedures.
  4. Operations: Include the following, as applicable:
    - a. Startup procedures.
    - b. Equipment or system break-in procedures.
    - c. Routine and normal operating instructions.
    - d. Regulation and control procedures.
    - e. Control sequences.
    - f. Safety procedures.
    - g. Instructions on stopping.
    - h. Normal shutdown instructions.
    - i. Operating procedures for emergencies.



- j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
  - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

### **3.2 INSTRUCTION**

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. The Commissioning Agent will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
  - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
  - 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner, through Owner's Project Manager, with at least fourteen (14) days' advance notice.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written and demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

### **3.3 DEMONSTRATION AND TRAINING VIDEOTAPES**

- A. General: Engage a qualified commercial photographer to record demonstration and training. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
  - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Provide digital recordings for final preparation of DVDs. Optional Videotape Format: Provide high-quality VHS color videotape in full-size cassettes for conversion to DVD format.
- C. DVD Format: Provide six (6) copies of each demonstrations and trainings.
- D. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
- E. Narration: Describe scenes on videotape by audio narration by microphone while videotape is recorded. Include description of items being viewed. Describe vantage

point, indicating location, direction (by compass point), and elevation or story of construction.

- F. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

**END OF SECTION 017900**

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SECTION 01 81 13  
SUSTAINABLE DESIGN REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes general requirements and procedures for compliance with certain prerequisites and credits needed for Project to obtain "LEED Version 4 for Building Design and Construction: Schools" (LEED v4 BD+C: Schools) Silver certification based on USGBC's LEED v4 BD+C: Schools.
  - 1. Specific requirements for LEED are also included in other Sections.
  - 2. Some LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
  - 3. A copy of the LEED Project checklist is attached at the end of this Section for information only.
    - a. Some LEED prerequisites and credits needed to obtain the indicated LEED certification depend on aspects of Project that are not part of the Work of the Contract.
  - 4. A copy of the LEED Materials Reporting Form is included at the end of this section.
  - 5. Definitions included in the "LEED Version 4 for Building Design and Construction" (LEED v4 BD+C) Reference Guide and online amendments apply to this Section.
- B. Related Requirements:
  - 1. Section 01 33 00, Submittal Procedures.
  - 2. Section 01 50 00, Temporary Facilities and Controls for temporary heating and cooling requirements.
  - 3. Section 01 74 19, Construction Waste Management
  - 4. Section 01 81 19, Indoor Air Quality Requirements.
  - 5. Section 01 91 13, General Commissioning Requirements
  - 6. Section 01 91 19 Exterior Enclosure Commissioning Requirements
  - 7. Divisions 02 through 49 Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED.

1.03 DEFINITIONS

- A. Bio-Based Materials: Materials that meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials shall be tested using ASTM D 6866 and be legally harvested, as defined by the exporting and receiving country.

- B. CDPH Standard Method v1.1: California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.1–2010, for the emissions testing and requirements of products and materials.
- C. Chain-of-Custody (COC): A procedure that tracks a product from the point of harvest or extraction to its end use, including all successive stage of processing, transformation, manufacturing, a distribution.
- D. Chain-of-Custody Certificates: Certificates signed by manufacturers and fabricators certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.
- E. Composite Wood and Agrifiber: Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.
- F. Corporate Sustainability Report: A third-party verified report that outlines the environmental impacts of extraction operations and activities associated with the manufacturer's product and the product's supply chain.
- G. Environmental Product Declaration (EPD): An independently verified report based on life-cycle assessment studies that have been conducted according to a set of common rules for each product category and peer-reviewed.
  - 1. Product-Specific Declaration: A product with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that has at least a cradle to gate scope.
  - 2. Industry-Wide (Generic) EPD: Provide products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator. EPD must conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
  - 3. Product-Specific Type III EPD: A product with a third-party certification, including external verification, in which the manufacturer is explicitly recognized by the program operator. EPD must conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
- H. Extended Producer Responsibility (EPR): Measures undertaken by the maker of a product to accept its own and sometimes other manufacturers' products as postconsumer waste at the end of the products' useful life.
- I. Health Product Declaration Open Standard (HPD): A standard format for reporting product content and associated health information for building products and materials.
- J. Indoor Air Quality (IAQ) Management Plan: Plan developed by the Contractor to provide a healthy indoor environment for workers and building occupants during construction. Plan must meet or exceed the recommendations of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) "IAQ Guidelines for Occupied Buildings Under Construction."
- K. Leadership Extraction Practices: Products that meet at least one of the responsible extraction criteria, which include: extended producer responsibility; bio-based materials; FSC wood products; materials reuse; recycled content; and other USGBC approved programs.

- L. **Material Cost:** The dollar value of materials being provided to the site, after Contractor mark-ups, including transportation costs, taxes, fees, and shop labor, but excluding field equipment and field labor costs.
- M. **Materials Reuse:** Reuse includes salvaged, refurbished, or reused products.
- N. **Multi-Attribute Optimization:** Third party certified products that demonstrate impact reduction below industry average in at least three of the following six categories: global warming potential; stratospheric ozone depletion; acidification; eutrophication; tropospheric ozone creation; nonrenewable resource depletion.
- O. **Recycled Content:** Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on cost.
  - 1. "Postconsumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
  - 2. "Preconsumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials, such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it.
- P. **Regional Materials:** Materials that are extracted, harvested, recovered, and manufactured within a radius of 100 miles from the Project site.
- Q. **Volatile Organic Compounds (VOC) Emissions Test:** Refer to CDPH Standard Method v1.1 definition.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Work of this project includes completed building and application for LEED certification. Work is not complete until Owner has accepted USGBC's final review of LEED certification.
  - 1. Provide documentation required by LEED and LEED review.
- B. Provide materials and procedures necessary to obtain LEED prerequisites and credits required in this Section. Other Sections may specify requirements that contribute to LEED prerequisites and credits. Refer to other sections for additional materials and procedures necessary to obtain LEED prerequisites and credits.
- C. Respond to questions and requests for additional information from Architect and the USGBC regarding LEED credits until the USGBC has made its determination on the project's LEED certification application.
- D. **LEED Online Submittals:** Upload LEED documentation submittal data directly to USGBC project "LEED Online" website. Complete online forms at least monthly and as necessary to document LEED credits for submittals required in this Section.
- E. **LEED Conference:** Schedule and conduct a conference at a time convenient to Owner and Architect within 21 days prior to commencement of the work. Advise Architect, Owner's Commissioning Authority, and Owner's Project Manager of scheduled meeting dates.

1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Owner's Project Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: LEED goals for the project, Contractor's action plans, and discussion of targeted LEED Prerequisites and Credits.
3. Minutes: Record and distribute minutes to attendees and other entities with responsibilities for obtaining LEED Credits.

#### 1.05 ACTION SUBMITTALS

- A. General: Submit additional LEED submittals required by other Specification Sections.

1. Submit each LEED submittal simultaneously with applicable product submittal.

- B. LEED Documentation Submittals:

1. General, LEED Materials Reporting Form: Project submittals must be accompanied by a completed LEED Materials Reporting Form. Submittal packages must also include highlighted documentation supporting the sustainability claims made on the LEED Materials Reporting Form.
2. SSc5, Heat Island Reduction: Product data for roof and non-roof hardscape products indicating compliance with solar reflectance index (SRI) and solar reflectance (SR) requirements.
3. EAp3, Building-Level Energy Metering: Product data for meters, sensors, and data collection system used to provide continuous metering of building energy-consumption performance.
4. EAc3, Advanced Energy Metering: Product data for meters, sensors, and data collection system used to provide continuous metering of individual energy-consumption performance of any individual energy end uses that represent 10% or more of the total annual consumption of the building.
5. MRp2/MRc5, Construction and Demolition Waste Management: Comply with submittal requirements of Section 01 74 19 "Construction Waste Management and Disposal."
6. MRc2, Building Product Disclosure and Optimization: Environmental Product Declarations complying with LEED requirements.
7. MRc3, Building Product Disclosure and Optimization, Sourcing of Raw Materials: Option 2, Leadership Extraction Practices.
  - a. Extended Producer Responsibility: Product data and certification letter from product manufacturers, indicating participation in an extended producer responsibility program and statement of costs.
  - b. Bio-Based Materials: Product data and certification for bio-based materials, indicating that they comply with requirements. Include statement of costs.
  - c. Certified Wood: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
  - d. Materials Reuse: Receipts for salvaged and refurbished materials used for Project, indicating sources and costs.
  - e. Recycled Content: Product data and certification letter from product manufacturers, indicating percentages by weight of postconsumer and



- preconsumer recycled content for products having recycled content. Include statement of costs.
- f. Regional Content: Product data and certification letter from product manufacturers, indicating extraction, harvest, recovery, and manufacturer location and distance (miles) from the Project site.
8. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.
- a. Material ingredient reports for products that comply with LEED requirements for material ingredient reporting, including but not limited to the following:
- 1) Manufacturer Inventory.
  - 2) Health Product Declaration.
  - 3) Cradle to Cradle certifications.
  - 4) Declare product labels.
9. EQp2/EQc3/EQc4, Indoor Air Quality: Comply with submittal requirements of 01 81 19, Indoor Air Quality Requirements.
10. EQc2, Low-Emitting Materials: Product data, indicating VOC content, volume of product used, emissions testing documents, and/or other required product category evaluation criteria, showing compliance with requirements for low-emitting materials for the following products:

| Product Category  | VOC<br>Conte<br>nt | Volum<br>e<br>Used<br>(budg<br>et<br>metho<br>d<br>only) | General<br>Emissions<br>Complianc<br>e | Category<br>Evaluation<br>Compliance |
|---|--------------------|--|--|--------------------------------------|
| a. Paints and coatings  | X                  | X  | X                                      |                                      |
| b. Adhesives and sealants   | X                  | X  | X                                      |                                      |
| c. Flooring   |                    |  | X                                      |                                      |
| d. Products containing composite wood or agrifiber products or wood glues |                    |  |  | X<br>(ULEF,<br>NAF)                  |
| e. Ceilings, walls, thermal, and acoustic insulation                      |                    |  | X                                      | X<br>(Batt<br>Insulation)            |
| f. Exterior applied materials.<br>(Healthcare and Schools projects only)  | X                  | X  |  |                                      |

#### 1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For LEED coordinator.
- B. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:
1. Mechanical.

2. Electrical.
  3. Plumbing.
  4. Wood construction materials.
  5. Furniture.
  6. Earthwork and exterior improvements, hard costs.
- C. LEED Action Plan Components: Provide preliminary submittals within 30 days of date established for the Notice to Proceed indicating how the following requirements will be met:
1. MRp2/MRc5, Waste management plan, complying with Section 01 74 19 Construction Waste Management
  2. EQp2/EQ3/EQ4, Indoor air quality plan, complying with Section 01 81 19, Indoor Air Quality Requirements.
- D. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:
1. MRp2/MRc5, Waste reduction progress reports complying with Section 01 74 19 Construction Waste Management
  2. MRc2, Building product disclosure and optimization – environmental product declarations.
    - a. LEEDv4 MR BPDO Calculator or equivalent MR Tracking Sheet monitoring the project's progress towards targeted LEED MR Credits. To be presented at construction meetings.
  3. MRc3, Building product disclosure and optimization – sourcing of raw materials.
    - a. Option 2:
      - 1) Extended producer responsibility.
      - 2) Bio-based materials.
      - 3) Certified wood products.
      - 4) Materials reuse.
      - 5) Recycled content.AND additionally for any product meeting at least one of attributes 1-5 above:
      - 6) Regional content.
    - b. LEEDv4 MR BPDO Calculator or equivalent MR Tracking Sheet monitoring the project's progress towards targeted LEED MR Credits. To be presented at construction meetings.
  4. MRc4, Building product disclosure and optimization – material ingredients.
    - a. LEEDv4 MR BPDO Calculator or equivalent MR Tracking Sheet monitoring the project's progress towards targeted LEED MR Credits. To be presented at construction meetings.
  5. EQc2, Low emitting materials.
    - a. LEEDv4 Low Emitting Materials Calculator or equivalent Low Emitting Materials Tracking Sheet monitoring the project's progress towards targeted LEED Indoor Environmental Quality Credits. To be presented at construction meetings.
  6. EQc3, Indoor air quality, during construction, complying with Section 01 81 19, Indoor Air Quality Requirements.

7. EQc4, Indoor air quality assessment, complying with Section 01 81 19, Indoor Air Quality Requirements.

## 1.07 QUALITY ASSURANCE

- A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

## PART 2 - PRODUCTS

### 2.01 MATERIALS, GENERAL

- A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated. Contractor to determine a combination of credit options best suited for achieving credits required.

1. Exclusions: Special equipment, such as elevators, escalators, process equipment, and fire suppression systems, is excluded from the credit calculations. Also excluded are products purchased for temporary use on the project, like formwork for concrete.

- B. Unauthorized Products: Materials and products required for work of this section shall not contain asbestos, lead, mercury, polychlorinated biphenyls (PCBs), or other hazardous materials identified by the Owner.

### 2.02 BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION

- A. MRc2, Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Option 1. Provide at least 20 permanently installed products (sourced from at least 5 different manufacturers) which meet one of the disclosure criteria:

1. Product-Specific Declaration: Valued as one quarter (1/4) of a product.
2. Industry-Wide (Generic) EPD: Valued as one half (1/2) of a product.
3. Product-Specific Type III EPD: Valued as one whole product.

- B. MRc3, Building Product Disclosure and Optimization, Sourcing of Raw Materials: Option 2, Leadership Extraction Practices. Provide products that meet at least one of the responsible extraction criteria below for at least 25%, by cost, of the total value of permanently installed building products in the project:

1. Extended producer responsibility program.
2. Bio-based materials.
3. Certified Wood: Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:
  - a. Rough carpentry.
  - b. Miscellaneous carpentry.
  - c. Heavy timber construction.
  - d. Wood decking.

- e. Metal-plate-connected wood trusses.
  - f. Structural glued-laminated timber.
  - g. Finish carpentry.
  - h. Architectural woodwork.
  - i. Wood paneling.
  - j. Wood veneer wall covering.
  - k. Wood flooring.
  - l. Wood lockers.
  - m. Wood cabinets.
- 4. Recycled content.
  - a. Exceptions: Do not include furniture, fire protection, operational plumbing, operational mechanical, and operational electrical components, and specialty items, such as elevators and equipment, in the calculation.
- 5. AND Regional content, only for a product that meets at least one of the attributes 1-4 listed above.
- 6. Note: Structure and enclosure materials may not constitute more than 30% of the value of MRc3 compliant building products.
- C. MRc4, Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.
  - 1. Use at least 20 different permanently installed products from at least five different manufacturers that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:
    - a. Manufacturer Inventory.
    - b. Health Product Declarations (HPDs).
    - c. Cradle to Cradle (C2C) certifications.
    - d. Declare product labels.

## 2.03 LOW-EMITTING MATERIALS

- A. EQc2, Low-Emitting Materials, General Emissions Requirements: Products must demonstrate they have been tested and determined compliant in accordance with California Department of Public Health, (CDHP), Standard Method v1.1-2010, using the applicable exposure scenario. Manufacturer's documentation demonstrating compliance must state the range of total VOCs (tVOC) after 14 days measured as specified in the CDPH Standard Method v1.1 as follows:
  - 1. 0.5mg/m<sup>3</sup> or less,
  - 2. between 0.5 and 5.0 mg/m<sup>3</sup> or,
  - 3. 0.50 mg/m<sup>3</sup> or more.
- B. EQc2, Low-Emitting Materials, Paints and Coatings, VOC content: For field applications that are inside the weatherproofing system, 100 percent of paints and coatings shall comply with the limits for VOC content when calculated according to the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, OR the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.

| Product Type:  | Allowable VOC Content (g/L): |
|--|------------------------------|
| Bond Breaker   | 350                          |
| Clear wood finishes - Varnish  | 275                          |
| Clear wood finishes – Sanding Sealer                                     | 275                          |
| Clear wood finishes - Lacquer  | 275                          |
| Colorant – Architectural Coatings, excluding IM coatings                 | 50                           |
| Colorant – Solvent Based IM  | 600                          |
| Colorant - Waterborne IM   | 50                           |
| Concrete – Curing compounds  | 100                          |
| Concrete – Curing compounds for roadways & bridges                       | 350                          |
| Concrete surface retarder  | 50                           |
| Driveway Sealer  | 50                           |
| Dry-fog coatings   | 50                           |
| Faux finishing coatings - Clear topcoat                                  | 100                          |
| Faux finishing coatings – Decorative Coatings                            | 350                          |
| Faux finishing coatings - Glazes   | 350                          |
| Faux finishing coatings - Japan  | 350                          |
| Faux finishing coatings – Trowel applied coatings                        | 50                           |
| Fire-proof coatings  | 150                          |
| Flats  | 50                           |
| Floor coatings   | 50                           |
| Form release compounds   | 100                          |
| Graphic arts (sign) coatings   | 150                          |
| Industrial maintenance coatings  | 100                          |
| Industrial maintenance coatings – High temperature IM coatings           | 420                          |
| Industrial maintenance coatings – Non-sacrificial anti-graffiti coatings | 100                          |
| Industrial maintenance coatings – Zinc rich IM primers                   | 100                          |
| Magnesite cement coatings  | 450                          |
| Mastic coatings  | 100                          |
| Metallic pigmented coatings  | 150                          |
| Multi-color coatings   | 250                          |
| Non-flat coatings  | 50                           |
| Pre-treatment wash primers   | 420                          |
| Primers, sealers and undercoaters  | 100                          |
| Reactive penetrating sealers   | 350                          |
| Recycled coatings  | 250                          |
| Roof coatings  | 50                           |
| Roof coatings, aluminum  | 100                          |
| Roof primers, bituminous   | 350                          |
| Rust preventative coatings   | 100                          |

|  |     |
|--|-----|
| Stone consolidant                      | 450 |
| Sacrificial anti-graffiti coatings     | 50  |
| Shellac- Clear                         | 730 |
| Shellac – Pigmented                    | 550 |
| Specialty primers                      | 100 |
| Stains                                 | 100 |
| Stains, interior                       | 250 |
| Swimming pool coatings – repair        | 340 |
| Swimming pool coatings – other         | 340 |
| Traffic Coatings                       | 100 |
| Waterproofing sealers                  | 100 |
| Waterproofing concrete/masonry sealers | 100 |
| Wood preservatives                     | 350 |
| Low solids coatings                    | 120 |

- C. EQc2, Low-Emitting Materials, Paints and Coatings, General Emissions Requirement: For field applications that are inside the weatherproofing system, at least 90 percent of paints and coatings, measured by volume, shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
1. To comply with the General Emissions Requirement, products shall meet one of the following:
    - a. UL Greenguard Gold Certified
    - b. SCS Indoor Advantage Gold Certified
    - c. MAS Certified Green
    - d. Meet California Department of Public Health (CDHP), Standard Method v1.1-2010, using the applicable exposure scenario.
- D. EQc2, Low-Emitting Materials, Adhesives and Sealants, VOC content: For field applications that are inside the weatherproofing system, 100 percent of adhesives and sealants shall comply with the limits for VOC content when calculated according to South Coast Air Quality Management District (SCAQMD) Rule #1168, requirements in effect on July 1, 2005, and rule amendment date January 7, 2005:

| Architectural Applications:         | Allowable VOC Content (g/L): |
|-------------------------------------|------------------------------|
| Indoor carpet adhesives             | 50                           |
| Carpet pad adhesives                | 50                           |
| Outdoor carpet adhesives            | 150                          |
| Wood flooring adhesives             | 100                          |
| Rubber floor adhesives              | 60                           |
| Subfloor adhesives                  | 50                           |
| Ceramic tile adhesives              | 65                           |
| VCT and asphalt tile adhesives      | 50                           |
| Dry wall and panel adhesives        | 50                           |
| Cove base adhesives                 | 50                           |
| Multipurpose construction adhesives | 70                           |

|  |     |
|--|-----|
| Structural glazing adhesives   | 100 |
| Single ply roof membrane adhesives   | 250 |
| Specialty Applications:  |     |
| PVC welding  | 510 |
| CPVC welding   | 490 |
| ABS welding  | 325 |
| Plastic cement welding   | 250 |
| Adhesive primer for plastic  | 550 |
| Computer diskette manufacturing  | 350 |
| Contact adhesive   | 80  |
| Special purpose contact adhesive   | 250 |
| Tire retread   | 100 |
| Adhesive primer for traffic marking tape   | 150 |
| Structural wood member adhesive  | 140 |
| Sheet applied rubber lining operations specialty                                 | 850 |
| Top and Trim adhesive  | 250 |
| Substrate Specific Applications:   |     |
| Metal to metal substrate specific adhesives                                      | 30  |
| Plastic foam substrate specific adhesives  | 50  |
| Porous material (except wood) substrate specific adhesives                       | 50  |
| Wood substrate specific adhesives  | 30  |
| Fiberglass substrate specific adhesives  | 80  |
| Sealants:  |     |
| Architectural sealant  | 250 |
| Marine deck sealant  | 760 |
| Nonmember roof sealant   | 300 |
| Roadway sealant  | 250 |
| Single-ply roof membrane sealant   | 450 |
| Other sealant  | 420 |
| Sealant Primers:   |     |
| Architectural non-porous sealant primer  | 250 |
| Architectural porous sealant primer  | 775 |
| Modified bituminous sealant primer   | 500 |
| Marine deck sealant primer   | 760 |
| Other sealant primer   | 750 |
| Other  |     |
| Other adhesives, adhesive bonding primers, adhesive primers or any other primers | 250 |

- Exception: The provisions of SCAQMD Rule 1168 do not apply to adhesives and sealants subject to state or federal consumer product VOC regulations.

- E. EQc2, Low-Emitting Materials, Adhesives and Sealants, General Emissions Requirement: For field applications that are inside the weatherproofing system, at least 90 percent of adhesives

and sealants, measured by volume, shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

1. To comply with the General Emissions Requirement, products shall meet one of the following:
  - a. UL Greenguard Gold Certified
  - b. SCS Indoor Advantage Gold Certified
  - c. MAS Certified Green
  - d. Meet California Department of Public Health (CDHP), Standard Method v1.1-2010, using the applicable exposure scenario.
- F. EQc2, Low-Emitting Materials, Flooring, General Emissions Requirement: 100 percent of flooring shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
  1. To comply with the General Emissions Requirement, products shall meet one of the following:
    - a. FloorScore Certified (hard surface flooring and flooring adhesives)
    - b. Green Label Plus certified (carpet, adhesive, and cushion)
    - c. NSF/ANSI 332 certified (resilient flooring)
    - d. Meet California Department of Public Health (CDHP), Standard Method v1.1-2010, using the applicable exposure scenario.
- G. EQc2, Low-Emitting Materials, Composite Wood: 100 percent of composite wood, agrifiber products, and adhesives shall be made using ultra-low-emitting formaldehyde (ULEF) resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde (NAF).
- H. EQc2, Low-Emitting Materials, Ceilings, Walls, Thermal, and Acoustic Insulation, General Emissions Requirement: 100 percent of ceilings, walls, and thermal insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- I. EQc2, Low-Emitting Materials, Ceilings, Walls, Thermal, and Acoustic Insulation, Batt Insulation Requirement: 100 percent of batt insulation products may contain no added formaldehyde, including urea formaldehyde, phenol formaldehyde, and urea-extended phenol formaldehyde.
- J. EQc2, Low-Emitting Materials, Exterior Applied Materials, VOC content: For field applications that are exterior applied, at least 90 percent of adhesives, sealants, coatings, roofing, and waterproofing, measured by volume, shall comply with the limits for VOC content when calculated according to the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, AND the South Coast Air Quality Management District (SCAQMD) Rule 1168, effective June 3, 2011 for adhesives and sealants.
  1. Refer to Table under 2.01, B and D above for allowable VOC content (limits are also applicable to exterior materials). Refer to CARB 2007 SCM and SCAQMD Rule 1168 for any products not listed.
  2. The following materials are prohibited and do not count toward total percentage compliance:



- a. Hot-mopped asphalt for roofing.
- b. Coal tar sealants for parking lots and other paved surfaces.

K. Additional Low-Emitting Requirements:

- 1. If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1% weight by mass (total exempt compounds) must be disclosed.
- 2. If a product cannot reasonably be tested as specified above, testing of VOC content must comply with ASTM D2369-10; ISO 11890, part 1; ASTM D6886-03; or ISO 11890-2.
- 3. Methylene chloride and perchloroethylene may not be intentionally added in paints, coatings, adhesives, or sealants.

2.04 INDOOR WATER USE REDUCTION

- A. WEp2, Indoor Water Use Reduction, Appliances: Provide ENERGY STAR or performance equivalent appliances.
- B. WEp2/WEc2, Indoor Water Use Reduction, Plumbing Fixtures: Do not exceed water flow requirements indicated in Division 22 - PLUMBING. All newly installed toilets, urinals, private lavatory faucets, and showerheads that are eligible for labeling must be WaterSense labeled.

PART 3 - EXECUTION

3.01 NONSMOKING BUILDING

- A. EQp2, Environmental Tobacco Smoke Control: Smoking is not permitted on the property.
  - 1. Refer to Section 01 81 19, Indoor Air Quality Requirements.

3.02 CONSTRUCTION WASTE MANAGEMENT

- A. MRp2 MRc5, Construction and Demolition Waste Management: Comply with Section 01 74 19 Construction Waste Management

3.03 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

- A. EQc3/EQc4, Construction Indoor Air Quality Management Plan: Comply with Section 01 81 19, Indoor Air Quality Requirements.

END OF SECTION 01 81 13

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South High Community  
Worcester, MA

**LEED® V4 MATERIALS REPORTING FORM**

|  |                       |
|--|-----------------------|
| <b>MATERIAL OR PRODUCT:</b>                      |                       |
| <b>MATERIAL COST (LESS LABOR AND EQUIPMENT):</b> |                       |
| Contractor/Installer:                            | Manufacturer:         |
| Address:   | Manufacturer Address: |
| Contact:   |                       |

Signed by: \_\_\_\_\_

Date: \_\_\_\_\_

Company: \_\_\_\_\_

**Instructions to Contractor/Installer:** Please complete the following information in all appropriate categories. Use one documentation sheet for each product or material (e.g. tile and grout each get their own sheet). Attach any supporting information to this sheet (e.g. cut sheets, letters from manufacturers, etc.).

**REGIONAL MATERIALS**

(For Division 3-10 & 31.60.00, 32.10.00, 32.30.00, 32.90.00 products and materials)

|                       |               |
|-----------------------|---------------|
| Product Manufacturer: | Product Name: |
|                       |               |
|                       |               |
|                       |               |

*Does the product contain **regionally<sup>1</sup> extracted, harvested, or recovered<sup>2</sup> materials?***

|                |                  |
|----------------|------------------|
| Raw Materials: | Miles to Project |
|                |                  |
|                |                  |
|                |                  |

*Was the material/product **manufactured<sup>3</sup> and purchased regionally?***

|  |  |
|--|--|
| Location of Manufacturer (City/State):             |  |
| Distance from Manufacturer to Project Site (Miles) |  |
| Location of Distributor (City/State)               |  |
| Distance from Distributor to Project Site (Miles)  |  |

**LEED MR Credit 2 – BPDO: Environmental Product Declarations**

*Does the product have a manufacturer's **Environmental Product Declaration (EPD)<sup>4</sup>?***

|                       |               |                     |
|-----------------------|---------------|---------------------|
| Product Manufacturer: | Product Name: | EPD Provided? (Y/N) |
|                       |               |                     |
|                       |               |                     |
|                       |               |                     |
|                       |               |                     |

1. Regional: within 100 miles of project site as-the-crow-flies.
2. Extraction, harvest, or recovery location: Location of origin for virgin or recycled resources from which the building product's components are made. (i.e. before processing or manufacturing.)
3. Manufactured Location: Final assembly of components into the building product that is furnished or installed.
4. Environmental Product Declaration (EPD): a statement that the item meets the environmental requirements of ISO 14021-1999, ISO 14025-2006 and EN 15804, or ISO 21930-2007.

### **LEED MR Credit 3 – BPDO: Sourcing of Raw Materials**

(For Division 3-10 & 31.60.00, 32.10.00, 32.30.00, 32.90.00 products and materials)

*Does the manufacturer participate in an **extended producer responsibility**<sup>5</sup> program?*

| Product Manufacturer: | Product Name: | Extended Producer Responsibility Program? (Y/N) |
|-----------------------|---------------|---|
|                       |               |   |
|                       |               |   |

*Is the product **bio-based**<sup>6</sup>? If so, does it meet the Sustainable Agriculture Network's (SAN) Sustainable Agriculture Standard?*

| Product Manufacturer: | Product Name: | Meets SAN Sustainable Agriculture Standard? (Y/N) |
|-----------------------|---------------|---|
|                       |               |   |
|                       |               |   |

*Does the material/product contain **FSC Certified wood**?*

| Component: | Vendor Chain-of-Custody # | % Wood of Materials | % FSC Wood of Materials | Vendor invoice provided? (Y/N) |
|------------|---------------------------|---------------------|-------------------------|--------------------------------|
|            |                           |                     |                         |                                |
|            |                           |                     |                         |                                |

*Is the material/product **reused, salvaged or refurbished**?*

| Component: | Reused, Salvaged or Refurbished Product? (Y/N) | Actual Cost Paid or Replacement Value (whichever is higher): |
|------------|--|--|
|            |  |  |
|            |  |  |

*Does the material/product contain **post-consumer**<sup>7</sup> and/or **pre-consumer**<sup>8</sup> recycled content?*

|                                      |  |
|--------------------------------------|--|
| Percentage of post-consumer content: |  |
| Percentage of pre-consumer content:  |  |

*If only part of **the assembly contains recycled content**, fill in the chart below:*

| Assembly Components:                             | Weight: | % Post-Con | % Pre-Con |
|--|---------|------------|-----------|
|  |         |            |           |
|  |         |            |           |
|  |         |            |           |
|  |         |            |           |
| Totals by weight (should equal 100% of assembly) |         |            |           |

### **LEED MR Credit 4 – BPDO: Material Ingredients**

*Does the product have a manufacturer's **Health Product Declaration (HPD)**<sup>9</sup>?*

| Product Manufacturer: | Product Name: | HPD Provided? (Y/N) |
|-----------------------|---------------|---------------------|
|                       |               |                     |
|                       |               |                     |

5. Extended producer responsibility: measures undertaken by the maker of a product to accept its own and sometimes other manufacturer's products as postconsumer waste at the end of the product's useful life.
6. Bio-based Material: commercial or industrial products that are composed in whole, or in significant part, of biological products, renewable agricultural materials (including plant, animal, and marine materials), or forestry materials. Bio-based raw materials must be tested using ATSM Test Method D6866 and be legally harvested, as defined by the exporting and receiving country. Leather and other animal hides are excluded.
7. Post-Consumer Recycled Content: Portion of material or product which derives from discarded consumer waste that has been recovered for use as a raw material (e.g. plastic water bottles, newspaper)
8. Pre-Consumer Recycled Content: Portion of material or product which derives from recovered industrial materials that are diverted from municipal solid waste for use in a different mfg. process, prior to use by a consumer.
9. Health Product Declaration (HPD): a report of the materials or ingredients content of a building product and the associated health effects. Defining the content of this report is the Health Product Declaration Open Standard™

## LEED EQ Credit 2 – Low-Emitting Materials

(100% compliance, regardless of Division)

### ADHESIVES, SEALANTS, PAINTS, COATINGS

|                       |               |
|-----------------------|---------------|
| Product Manufacturer: | Product Name: |
|                       |               |
|                       |               |
|                       |               |
|                       |               |

Does the material/product comply with the **VOC content<sup>11</sup>** and **General Emissions testing requirement?**  
(Volume tracked for budget method ONLY.)

| Product Name: (as listed above) | VOC Content <sup>10</sup><br>(g/l) | Volume Used (L) | CDPH Emissions testing compliant? <sup>11</sup> | TVOC Emissions Range | Source Provided? (Y/N) |
|---------------------------------|------------------------------------|-----------------|---|----------------------|------------------------|
|                                 |                                    |                 |   |                      |                        |
|                                 |                                    |                 |   |                      |                        |
|                                 |                                    |                 |   |                      |                        |
|                                 |                                    |                 |   |                      |                        |

### FLOORING

Does the material/product comply with the **General Emissions testing requirement?**

| Product Manufacturer: | Product Name: | CDPH Emissions testing compliant? | TVOC Emissions Range | Source Provided? (Y/N) |
|-----------------------|---------------|-----------------------------------|----------------------|------------------------|
|                       |               |                                   |                      |                        |
|                       |               |                                   |                      |                        |
|                       |               |                                   |                      |                        |
|                       |               |                                   |                      |                        |

### COMPOSITE WOOD

Is the **composite wood material/product ULEF or NAF<sup>12</sup>**?

| Product Manufacturer: | Product Name: | ULEF or NAF? <sup>12</sup> | Source Provided? (Y/N) |
|-----------------------|---------------|----------------------------|------------------------|
|                       |               |                            |                        |
|                       |               |                            |                        |
|                       |               |                            |                        |
|                       |               |                            |                        |

### CEILINGS, WALLS, THERMAL AND ACOUSTIC INSULATION

Does the material/product comply with the **General Emissions testing requirement?** If product is a **batt insulation product**, does it contain added formaldehyde, including urea formaldehyde, phenol formaldehyde, and urea-extended phenol formaldehyde?

| Product Manufacturer: | Product Name: | CDPH Emissions testing compliant? | TVOC Emissions Range | Source Provided ? (Y/N) | Contains added formaldehyde ? |
|-----------------------|---------------|-----------------------------------|----------------------|-------------------------|-------------------------------|
|                       |               |                                   |                      |                         |                               |
|                       |               |                                   |                      |                         |                               |
|                       |               |                                   |                      |                         |                               |
|                       |               |                                   |                      |                         |                               |

10. All adhesives and sealants wet-applied on site must meet the applicable chemical content requirements of SCAQMD Rule 1168, July 1, 2005. All paints and coatings wet-applied on site must meet applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, effective June 3, 2011.

11. TVOC Emissions for Building products must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method v1.1-2010.

12. Composite Wood Evaluation as defined by the California Air Resources Board (CARB), Airborne Toxic Measure to Reduce Formaldehyde Emissions from Composite Wood Products Regulation, must be documented to have low formaldehyde emissions that meet the CARB ATCM for formaldehyde requirements for ultra-low-emitting formaldehyde (ULEF) resins or no added formaldehyde (NAF) resins.

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# LEED v4 for Schools Project Scorecard

Project Name: **South High Community School**

Address: 170 Apricot St, Worcester, MA

Date Updated: 4.9.18

|            |                                 |
|------------|---------------------------------|
| LEED Goal: | Silver                          |
| Bldg Area: | 349,398 gsf                     |
| Parking:   | 250 dedicated to HS (447 total) |
| Site Area: | 796,034 sf per L.O.W.           |
| Staff:     | 100 per 9.29 LPA email          |
| Students:  | 1,420 per 9.29 LPA email        |
| Visitors:  | Peak - 1,500; D.A. - 75         |

## PROJECT TOTALS

|       |     |    |    |    |
|-------|-----|----|----|----|
| Phase | 46  | 11 | 17 | 36 |
|       | Yes | M+ | M- | No |

## GENERAL PROJECT DOCUMENTATION

|                                     |    |           |    |                              |  |       |
|-------------------------------------|----|-----------|----|------------------------------|--|-------|
| <div><div>D</div><div>Y</div></div> |    | PI form 1 |    | Minimum Program Requirements |  | Req'd |
| Yes                                 | M+ | M-        | No |                              |  |       |

|   |   |   |   |
|---|---|---|---|
| 0 | 0 | 1 | 0 |
|---|---|---|---|

## INTEGRATIVE PROCESS

1

|   |  |  |   |  |          |  |                     |  |   |
|---|--|--|---|--|----------|--|---------------------|--|---|
| D |  |  | 1 |  | Credit 1 |  | Integrative Process |  | 1 |
|---|--|--|---|--|----------|--|---------------------|--|---|

|   |   |   |    |
|---|---|---|----|
| 1 | 1 | 1 | 12 |
|---|---|---|----|

## LOCATION & TRANSPORTATION

15

|   |   |   |   |   |          |  |  |     |
|---|---|---|---|---|----------|--|--|-----|
| D |   |   |   | N | Credit 1 |  | LEED for Neighborhood Development Location | 15  |
| D | 1 |   |   |   | Credit 2 |  | Sensitive Land Protection                  | 1   |
| D |   |   |   | 2 | Credit 3 |  | High Priority Site                         | 1-2 |
| D |   |   |   | 5 | Credit 4 |  | Surrounding Density and Diverse Uses       | 1-5 |
| D |   |   |   | 4 | Credit 5 |  | Access to Quality Transit                  | 1-4 |
| D |   |   |   | 1 | Credit 6 |  | Bicycle Facilities                         | 1   |
| D |   | 1 |   |   | Credit 7 |  | Reduced Parking Footprint                  | 1   |
| D |   |   | 1 |   | Credit 8 |  | Green Vehicles                             | 1   |

|   |   |   |   |
|---|---|---|---|
| 5 | 0 | 3 | 4 |
|---|---|---|---|

## SUSTAINABLE SITES

11

|   |   |  |   |   |          |  |   |       |
|---|---|--|---|---|----------|--|---|-------|
| C | Y |  |   |   | Prereq 1 |  | Construction Activity Pollution Prevention    | Req'd |
| D | Y |  |   |   | Prereq 2 |  | Environmental Site Assessment                 | Req'd |
| D | 1 |  |   |   | Credit 1 |  | Site Assessment                               | 1     |
| D |   |  |   | 2 | Credit 2 |  | Site Development - Protect or Restore Habitat | 1-2   |
| D |   |  |   | 1 | Credit 3 |  | Open Space                                    | 1     |
| D |   |  | 3 |   | Credit 4 |  | <u>Rainwater Management</u>                   | 2-3   |
| D | 2 |  |   |   | Credit 5 |  | Heat Island Reduction                         | 1-2   |
| D | 1 |  |   |   | Credit 6 |  | Light Pollution Reduction                     | 1     |
| D |   |  |   | 1 | Credit 7 |  | Site Master Plan                              | 1     |
| D | 1 |  |   |   | Credit 8 |  | Joint Use of Facilities                       | 1     |

|   |   |   |   |
|---|---|---|---|
| 2 | 2 | 1 | 7 |
|---|---|---|---|

## WATER EFFICIENCY

12

|   |   |   |   |   |          |  |                               |       |
|---|---|---|---|---|----------|--|-------------------------------|-------|
| D | Y |   |   |   | Prereq 1 |  | Outdoor Water Use Reduction   | Req'd |
| D | Y |   |   |   | Prereq 2 |  | Indoor Water Use Reduction    | Req'd |
| D | Y |   |   |   | Prereq 3 |  | Building-level Water Metering | Req'd |
| D | 1 |   |   | 1 | Credit 1 |  | Outdoor Water Use Reduction   | 1-2   |
| D |   | 2 | 1 | 4 | Credit 2 |  | Indoor Water Use Reduction    | 1-7   |
| D |   |   |   | 2 | Credit 3 |  | Cooling Tower Water Use       | 1-2   |
| D | 1 |   |   |   | Credit 4 |  | Water Metering                | 1     |

|    |   |   |   |
|----|---|---|---|
| 19 | 6 | 3 | 3 |
|----|---|---|---|

## ENERGY & ATMOSPHERE

33

|   |    |   |   |   |          |  |       |
|---|----|---|---|---|----------|--|-------|
| C | Y  |   |   |   | Prereq 1 | Fundamental Commissioning and Verification | Req'd |
| D | Y  |   |   |   | Prereq 2 | Minimum Energy Performance                 | Req'd |
| D | Y  |   |   |   | Prereq 3 | Building-level Energy Metering             | Req'd |
| D | Y  |   |   |   | Prereq 4 | Fundamental Refrigerant Management         | Req'd |
| C | 5  |   |   | 1 | Credit 1 | Enhanced Commissioning                     | 2-6   |
| D | 10 | 6 |   |   | Credit 2 | <u>Optimize Energy Performance</u>         | 1-16  |
| D | 1  |   |   |   | Credit 3 | Advanced Energy Metering                   | 1     |
| C |    |   |   | 2 | Credit 4 | Demand Response                            | 1-2   |
| D | 3  |   |   |   | Credit 5 | <u>Renewable Energy Production</u>         | 1-3   |
| D |    |   | 1 |   | Credit 6 | Enhanced Refrigerant Management            | 1     |
| C |    |   | 2 |   | Credit 7 | Green Power and Carbon Offsets             | 1-2   |

| Yes |   |  |  |   | M+ | M- | No |                       |  |   |       |
|-----|---|--|--|---|----|----|----|-----------------------|--|---|-------|
| 4   |   |  |  |   | 0  | 4  | 5  | MATERIALS & RESOURCES |  |   | 14    |
| D   | Y |  |  |   |    |    |    | Prereq 1              |  | Storage & Collection of Recyclables                             | Req'd |
| C   | Y |  |  |   |    |    |    | Prereq 2              |  | Construction and Demolition Waste Management Plan               | Req'd |
| C   |   |  |  | 3 | 2  |    |    | Credit 1              |  | <u>Building Life-Cycle Impact Reduction</u>                     | 2-5   |
| C   | 1 |  |  |   | 1  |    |    | Credit 2              |  | Building Product Disclosure & Optimization-EPD's                | 1-2   |
| C   |   |  |  | 1 | 1  |    |    | Credit 3              |  | Building Product Disclosure & Optimization-Raw Materials        | 1-2   |
| C   | 1 |  |  |   | 1  |    |    | Credit 4              |  | Building Product Disclosure & Optimization-Material Ingredients | 1-2   |
| C   | 2 |  |  |   |    |    |    | Credit 5              |  | Construction and Demolition Waste Management                    | 1-2   |

| Yes |   |   |  |   | M+ | M- | No |                             |  |   |       |    |
|-----|---|---|--|---|----|----|----|-----------------------------|--|---|-------|----|
| 8   |   |   |  |   | 1  | 2  | 5  | INDOOR ENVIROMENTAL QUALITY |  |   |       | 14 |
| D   | Y |   |  |   |    |    |    | Prereq 1                    |  | Minimum IAQ Performance                   | Req'd |    |
| D   | Y |   |  |   |    |    |    | Prereq 2                    |  | Environmental Tobacco Smoke (ETS) Control | Req'd |    |
| D   | Y |   |  |   |    |    |    | Prereq 3                    |  | Minimum Acoustical Performance            | Req'd |    |
| D   | 2 |   |  |   |    |    |    | Credit 1                    |  | Enhanced IAQ Strategies                   | 1-2   |    |
| C   | 1 |   |  | 1 |    | 1  |    | Credit 2                    |  | Low-Emitting Materials                    | 1-3   |    |
| C   | 1 |   |  |   |    |    |    | Credit 3                    |  | Construction IAQ Management Plan          | 1     |    |
| C   | 1 | 1 |  |   |    |    |    | Credit 4                    |  | IAQ Assessment                            | 1-2   |    |
| D   | 1 |   |  |   |    |    |    | Credit 5                    |  | Thermal Comfort                           | 1     |    |
| D   | 1 |   |  | 1 |    |    |    | Credit 6                    |  | Interior Lighting                         | 1-2   |    |
| D   |   |   |  |   |    | 3  |    | Credit 7                    |  | Daylight                                  | 1-3   |    |
| D   | 1 |   |  |   |    |    |    | Credit 8                    |  | Quality Views                             | 1     |    |
| D   |   |   |  |   |    | 1  |    | Credit 9                    |  | Acoustic Performance                      | 1     |    |

|   | Yes | M+ | M- | No |                      |  |  |   |
|---|-----|----|----|----|----------------------|--|--|---|
|   | 5   | 1  | 0  | 0  | INNOVATION IN DESIGN |  |  | 6 |
| D | 1   |    |    |    | Credit 1             |  | Exemplary Performance: Renewable Energy Production | 1 |
| D | 1   |    |    |    | Credit 2             |  | Innovation: TBD                                    | 1 |
| D | 1   |    |    |    | Credit 3             |  | Innovation: TBD                                    | 1 |
| C |     | 1  |    |    | Credit 4             |  | Innovation Credit: TBD                             | 1 |
| C | 1   |    |    |    | Credit 5             |  | Pilot Credit: No Cooling Tower                     | 1 |
| C | 1   |    |    |    | Credit 6             |  | LEED Accredited Professional                       | 1 |

| Yes  |   |   |   |                   | M+       | M- | No  |   |   |  |
|--|---|---|---|-------------------|----------|----|---|---|---|--|
| 2  | 0 | 2 | 0 | REGIONAL PRIORITY |          |    |   |   | 4 |  |
| 01603 - Worcester, MA: SSc4 (2 pts), WEc2 (4 pts), WEc3 (2pts), MRc1 (2 pts), EAc2 (8 pts), EAc5 (2 pts) |   |   |   |                   |          |    |   |   |   |  |
| D  | 1 |   |   |                   | Credit 1 |    | <u>EAc2 Optimize Energy Performance (20%/8 pts)</u>     | 1 |   |  |
| D  | 1 |   |   |                   | Credit 2 |    | <u>EAc5 Renewable Energy Production (5%/2 pts)</u>      | 1 |   |  |
| D  |   |   | 1 |                   | Credit 3 |    | <u>SSc4 Rainwater Management (2 pts)</u>                | 1 |   |  |
| D  |   |   | 1 |                   | Credit 4 |    | <u>MRc1 Building Life-Cycle Impact Reduction (2pts)</u> | 1 |   |  |

|  | Yes | M+ | M- | No |  |
|--|-----|----|----|----|--|
|  | 46  | 11 | 17 | 36 | PROJECT TOTALS (Certification Estimates) |
|  |     |    |    |    | 110                                      |

Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80+ points



SECTION 01 81 19

INDOOR AIR QUALITY REQUIREMENTS

**PART 1 – GENERAL**

1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.02 SUMMARY

- A. Requirements for minimum indoor air quality (IAQ) performance standards during the period of construction.
- B. The Contractor shall develop, for Owner and Architect review, a Construction Indoor Air Quality Management Plan for this Project.
- C. Sustainable Design Intent: Comply with project requirements intended to achieve certification, measured and documented according to the LEED-S v4 Rating System, of the US Green Building Council.

1.03 RELATED REQUIREMENTS

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
  - 1. Section 01 11 00, Summary of Work.
  - 2. Section 01 33 00, Submittal procedures.
  - 2. Section 01 50 00, Temporary facilities and controls.
  - 3. Section 01 74 19, Construction Waste Management.
  - 4. Section 01 81 13, Sustainable Design Requirements.
  - 6. Section 01 91 13, Commissioning.
  - 7. Division 22, 23, 26
  - 8. Divisions 3 through 16 Specification Sections; Specific requirements relating to indoor air quality for each Section.

1.04 PERFORMANCE REQUIREMENTS

- A. Comply with minimum requirements of Sections 4 through 7 of ASHRAE 62.1-2010, Ventilation for Acceptable Indoor Air Quality and approved Addenda.
  - 1. Coordinate with requirements of Section 01 91 13, Commissioning, and Division 23 – MECHANICAL.
- B. Prevent exposure of building systems to environmental tobacco smoke during construction. At a minimum, take the following measures:
  - 1. Do not allow smoking on/in the project site.
  - 2. Locate exterior designated smoking areas at least 25 feet away from entries, outdoor air intakes and operable windows.
- C. During construction meet or exceed the minimum requirements of the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition, 2007, ANSI/SMACNA 008–2008, Chapter 3.
- D. Protect occupied portions of the building from transfer of dust and particulate matter, noise and odor emissions generated during construction in compliance with the minimum requirements of the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd edition 2007, ANSI/SMACNA 008-2008 Chapter 3.
- E. Protect absorptive materials from moisture damage when stored on-site and after installation.
- F. Use materials and products in compliance with the VOC content limits as established in LEED credit IEQ credit Low-Emitting Materials.
- G. During construction, comply with the following requirements, per LEED IEQ Construction Indoor Air Quality Management Plan:
  - 1. Develop and implement a moisture control plan to ensure dry conditions will be maintained to protect absorptive materials stored on site. Include criteria for protecting the building from moisture intrusion and occupant exposure to mold spores.
  - 2. If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-2007. Protect active outdoor air intakes and return air grilles with applicable filtration media. Periodically inspect temporary media and replace as necessary. Replace filtration media immediately prior to occupancy with MERV 13 or higher.

3. Develop and implement a plan to reduce noise and emissions on the construction site; address the following:

Surrounding community noise and vibration impacts. Determine which areas on and adjacent to the site will require special protection from noise.

Construction Worker training and protective equipment. Determine construction activities that may require the use of protective gear or specialty equipment and properly train workers in their use and/or operation.

Source Reduction. Develop and implement policies to limit truck and equipment idling on site and to limit vibration and noise from demolition and construction activities.

- H. After construction ends but before occupancy, comply with one of the following requirements, per LEED IEQc credit Indoor Air Quality Assessment:

1. Perform a Building Flush-out with outside air. After construction ends, prior to occupancy and with all interior finishes and furniture installed, install new filtration media and perform a building flush-out by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot of floor area while maintaining an internal temperature of at least 60°F and no higher than 80°F and relative humidity no higher than 60%.
  - a. If occupancy is desired before the flush-out is completed, the following must be met:
    - i. The space may be occupied only after delivery of a minimum of 3,500 cubic feet of outdoor air per square foot.
    - ii. Once the space is occupied, it must be ventilated at a minimum rate of 0.30 cubic foot per minute (cfm) per square foot of outdoor air or the design minimum outdoor air rate determined in EQ Prerequisite Minimum Indoor Air Quality Performance, whichever is greater.
    - iii. During each day of the flush-out period, ventilation must begin at least three hours before occupancy and continue during occupancy.
    - iv. These conditions must be maintained until a total of 14,000 cubic feet per square foot of outdoor air has been delivered to the space.
2. Conduct IAQ Testing for air contaminant levels in the building. Use testing protocols consistent with the EPA Compendium of Methods for the Determination of Air Pollutants in Indoor Air and as additionally detailed in the LEED v4 Reference Guide for Building Design and Construction.
  - a. Conduct all measurements before occupancy but during normal occupied hours, with the building ventilation system started at the normal daily start time and operated at the minimum outdoor airflow rate for the occupied mode throughout the test.
  - b. Test at least one location per ventilation system for each occupied space type; there must be a minimum of one test per floor. Locations selected for testing must represent worst-case zones where highest concentrations of contaminants

of concern are likely to occur. Test areas shall be no larger than 5,000 square feet.

- i. Projects that include identical spaces in their construction, finishes, configuration, square footage, and HVAC systems may test one in seven. If the sampled space fails the test, all seven must be tested.
- c. Laboratories that conduct the tests for chemical analysis of formaldehyde and volatile organic compounds must be accredited under ISO/IEC 17025 for the test methods they use.

#### 1.05 SUBMITTALS

- A. Construction Indoor Air Quality (IAQ) Management Plan: the Contractor shall submit a preliminary Construction IAQ Management Plan for review.
  - 1. Within 21 calendar days after receipt of Notice to Proceed, the Contractor shall submit to the Owner a finalized Construction IAQ Management Plan.
  - 2. The proposed Plan shall comply with Division 23 – MECHANICAL requirements.
  - 3. The proposed Plan shall include, but not be limited to, the following:
    - a. Protection of ventilation system components during construction.
    - b. Cleaning and replacing contaminated ventilation system components after construction, including filtration media.
    - c. Temporary ventilation.
    - d. Protection of absorptive materials from moisture damage when stored on-site and after installation, including exterior wall rain protection.
    - f. Noise reduction and emissions
    - g. Sequence of finish installation plan.
    - h. Selection of cleaning products and procedures to be used during construction and final cleaning.
    - i. Other items as required by SMACNA IAQ Guidelines for Occupied Buildings under Construction, 2nd edition 2007, ANSI/SMACNA 008-2008 Chapter 3.
  - 4. Coordinate Construction IAQ Management Plan with Owner's current IAQ management plans and procedures.
  - 5. Comply with the requirements of LEED IEQ Construction Indoor Air Quality Management Plan.
- B. Material Safety Data Sheets (MSDS): Submit for materials as required, with date clearly identified. MSDS must contain specific chemical content data identifying the percent of the total product mass represented by each listed chemical.
- C. Product Data: Submit for each type of filtration media used during construction and installed immediately prior to occupancy, include and highlight MERV values the documentation provided.
- D. Flush-out or IAQ Testing Documentation:

1. Submit a flush-out report that includes duration calculations and a description of flush-out procedure. Include a log of dates, hours, and recorded temperature and humidity. Also include the capacity of all HVAC units used and indicate which are permanent and which are temporary.
2. Submit an IAQ testing reports that includes a narrative describing procedures and how locations were determined, dates, and results of each test.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Take special care to prevent accumulation of moisture on materials and within packaging during delivery, storage, and handling to prevent development of mold and mildew inside packaging and on products.
- B. Immediately remove from site and properly dispose of materials showing signs of mold and mildew, including materials with moisture stains.
- C. When not in use, store products in original sealed containers, in a designated location

**PART 2 - PRODUCTS**

2.01 FILTRATION MEDIA

- A. Filtration Media: Comply with ASHRAE 52.2-2007 and provide filtration media with compliant MERV ratings as required.

**PART 3 - EXECUTION**

3.01 CONSTRUCTION IAQ MANAGEMENT PLAN IMPLEMENTATION

- A. IAQ Manager: The Contractor shall designate an on-site person responsible for instructing workers and overseeing and documenting results of the Construction IAQ Management Plan for the Project.
- B. Distribution: The Contractor shall distribute copies of the Construction IAQ Management Plan to the Job Site Foreman, each subcontractor, the Owner, and the Architect.
- C. Instruction: The Contractor shall provide on-site instruction of appropriate procedures and methods to be used by all parties at the appropriate stages of the Project.

- D. Preconditioning: Allow products, which have odors and significant VOC emissions, to off-gas in specified dry, well-ventilated space for sufficient period to dissipate odors and emissions prior to delivery to Project.
  - 1. Remove containers and packaging from materials prior to conditioning to maximize off-gassing of VOCs.
  - 2. Condition products in ventilated warehouse or other building.
- E. Coordinate Construction IAQ Management Plan with final cleaning as indicated in 017700 - CLOSEOUT PROCEDURES.

END OF SECTION

SECTION 01 91 13

COMMISSIONING REQUIREMENTS

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. The role of the Commissioning Agent will be to coordinate and administer the commissioning process, as defined herein. The commissioning process will be implemented in accordance with the Massachusetts School Building Authority Standard Scope of Commissioning Services documents dated September 10, 2009. The project incorporates a Building Envelope commissioning process as well as requirements for mechanical, electrical, plumbing, and technology systems commissioning.
- B. The General Contractor and his subcontractors (mechanical, plumbing, electrical, technology, building envelope, and associated trade subcontractors) shall be the prime contractor responsible for the installation and placing in service of all mechanical, electrical, plumbing, technology, and building envelope equipment and systems in the building. The Owner's Project Manager and the General Contractor shall assist the Commissioning Agent in implementation of the commissioning plan and in maintaining the schedule of commissioning events. The commissioning process will not be a substitute for any work by the General Contractor, or any Sub-Contractor of the General Contractor, to install or place in service any equipment or system in the building.
- C. The Mechanical, Electrical, Plumbing, Technology, and Building Envelope Contractors, including all associated subcontractors and equipment manufacturers, shall be fully responsible for installation, start-up, testing, adjusting, and balancing, and verification and performance testing of all MEP, technology, and building envelope equipment and systems as required by the project specifications. The Mechanical, Electrical, Plumbing, Technology, and Building Envelope Contractors, including all associated subcontractors and equipment manufacturers, shall be an active participant in the commissioning process as specified herein, as required, and as directed by the Owner's Project Manager, the Commissioning Agent, and the General Contractor.
- D. The commissioning process shall be a team effort to ensure that all mechanical, electrical, plumbing, technology, and building envelope equipment and systems have been completely and properly installed and function together correctly to meet the design intent. The commissioning process shall also document system performance parameters for fine tuning of control sequences and operational procedures. The commissioning process shall coordinate system documentation and installation; equipment start-up; building automation system calibration; testing, adjusting, and balancing; and verification and performance testing.

**1.02 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary General Conditions and other Division 01 specification sections, apply to work of this Section.
- B. Divisions: 04 (Masonry), 07 (Thermal and Moisture Protection), 08 (Openings), 21 (Fire Protection), 22 (Plumbing), 23 (HVAC), 26 (Electrical), 27 (Communications), 28 (Electronic Safety and Security) and specification.
- C. Specification sections: 01 91 12 Building Enclosure Commissioning, 21 08 00 Fire Suppression Commissioning, 22 08 00 Plumbing Commissioning, 23 08 00 HVAC Commissioning, 26 08 00 Electrical Commissioning, 27 08 00 Communications Commissioning, 28 08 00 Electronic Safety & Security Commissioning.
- D. All related specification sections shall be used in conjunction with this section.

**1.03 COMMISSIONING TEAM**

- A. A representative of each of the following parties shall be designated as a member of the Commissioning Team:
  - 1. Owner or Owner's Representative.
  - 2. Commissioning Agent (CxA).

3. Owner's Project Manager.
4. General Contractor.
5. Mechanical (HVAC) Subcontractor.
6. Building Automation System (BAS) Subcontractor.
7. Testing, Adjusting and Balancing (TAB) Subcontractor.
8. Plumbing Contractor (if different than HVAC Subcontractor).
9. Fire Protection Subcontractor.
10. Electrical Subcontractor.
11. Building Envelope Contractors.
12. Other subcontractors and equipment manufacturers as required.

- B. Each representative must attend scheduled meetings, in accordance with the Commissioning Agent's schedule.

#### 1.04 SCOPE OF WORK

- A. The work included in the commissioning process shall involve a complete and thorough evaluation of the operation and performance of all equipment and systems installed under this project. Equipment and systems that shall be evaluated include, but are not limited to, the following:

1. Mechanical systems:
  - a. Boilers
  - b. Piping
  - c. Pumps and drives
  - d. Air handler systems
  - e. Rooftop units
  - f. Heating and ventilating units
  - g. Terminal Units
  - h. Cabinet Unit Heaters
  - i. Fan Coil Units
  - j. Unit Heaters
  - k. Finned tube radiation
  - l. Convectors
  - m. Exhaust fans
  - n. Split system air conditioning
  - o. Make-up Air units
  - p. Heat recovery systems
  - q. Automated temperature controls
  - r. Testing, adjusting and balancing spot check verification
2. Plumbing systems:
  - a. Natural Gas Systems
  - b. Backflow preventers
  - c. Water Heaters, re-circulating pumps, mixing valves and storage
  - d. Water closets and sinks
  - e. Laboratory Waste and Neutralization Tank
  - f. Safety shower/eyewash stations
3. Life Safety systems;
  - a. Security
  - b. Fire Suppression/Fire Alarm systems
  - c. Egress lighting
4. Electrical systems;
  - a. Electrical service and switchgear
  - b. Transformers
  - c. Motor control centers



- d. Electrical distribution systems
    - e. Emergency and standby power systems
    - f. Lighting controls & occupancy sensors
    - g. Low voltage systems
    - h. Grounding and bonding systems
  - 5. Building Envelope Systems:
    - a. Roofing systems, including parapet, skylights and openings
    - b. Exterior Walls
    - c. Windows, doors, grilles, sunscreens, louvers, and vents
    - d. Infrared scan of envelope and roof by Commissioning Agent
- B. Documentation required from the Mechanical, Electrical, Plumbing, Technology, and Building Envelope Contractors, as part of the commissioning process shall include as appropriate and applicable:
  - 1. Equipment submittals and shop drawings for CxA review.
  - 2. Progress and status reports, including deficiencies noted.
  - 3. Manufacturers' suggested pre-functional checklists for CxA's use in developing pre-functional procedures.
  - 4. Start-up and testing documentation associated with systems being commissioned including but not limited to the following: duct leakage, pipe pressure, electrical testing, flushing / cleaning, etc.
  - 5. Performance (sign-off) of pre-functional checklists documentation. Including completed manufacturer start-up reports.
  - 6. Training agenda and material for CxA's review.
  - 7. Operation and maintenance (O&M) manuals.
- C. Pre-functional Checklists, Tests, and Startup:
  - 1. Pre-functional checklists (PC) are important to ensure that the equipment and systems are hooked up and operational and that functional performance testing may proceed without unnecessary delays. Each piece of equipment receives full pre-functional checkout by the Mechanical, Electrical, Plumbing, Technology, and Building Envelope Subcontractor. In general, the pre-functional testing for a given system must be successfully completed prior to formal functional performance testing or equipment or subsystems of the given system.
  - 2. Pre-functional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., oil levels OK, fan belt tension, labels affixed, gages in place, sensor calibration, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). The word "pre-functional" refers to before functional testing. Pre-functional checklists augment and may be combined with the manufacturer's start-up checklist.
  - 3. Mechanical, Electrical, Plumbing, Technology, and Building Envelope Subcontractors typically already perform some, if not many, of the pre-functional checklist items the commissioning authority will recommend. This project requires that the procedures be documented in writing by the installing technician where detailed in the project specifications. The CxA does not witness most of the pre-functional check listing, except for testing of larger or more critical pieces of equipment and some spot-checking. It is noted that the checklists generated by the CxA do not take the place of manufacturer or Trade Contractor required checklists. The CxA, with assistance as required from the installing Mechanical, Electrical, Plumbing, Technology, and Building Envelope Subcontractor, will complete checklists that are generated by the CxA.
- D. Commissioning Tests: Detailed testing shall be performed on all installed equipment and systems to ensure that operation and performance conform to contract documents and the design intent. All functional tests shall be witnessed by The Commissioning Agent. The following testing is required as part of the commissioning process:
  - 1. Verification Functional Tests:
    - a. Verification tests shall be comprised of a full range of checks and tests to determine that all components, equipment, systems, and interfaces between systems operate in accordance with contract documents and

the design intent. This shall include all operating modes, interlocks, control responses, and specific responses to abnormal or emergency conditions.

2. Functional Performance Tests:
  - a. Functional performance tests shall determine that the commissioned systems are operating in accordance with the Contract Documents and the design intent.

#### 1.05 ROLES AND RESPONSIBILITIES

- A. All Commissioning Team members shall be involved in the commissioning process. Following is a description of the responsibilities of each party:
  1. Owner or Owner's Representative:
    - a. Assign maintenance personnel and schedule them to participate in meetings, training sessions, and inspections.
  2. Commissioning Agent:
    - a. Develop the commissioning plan.
    - b. Review submittals for major equipment being commissioned.
    - c. Coordinate and administer the commissioning effort, through organization of all meetings, commissioning tests, demonstrations, and assisting with training events, described in the Contract Documents and in the commissioning plan.
    - d. Verify and spot check that pre-functional checklists and initial start-up has been performed and documented by the responsible mechanical, Electrical Subcontractors and their subcontractors.
    - e. Observe equipment and system start-up and testing. Ensure the results are documented (including a summary of deficiencies), and manufacturer / HVAC Subcontractor start-up forms are incorporated in the O&M manuals.
    - f. Attend the training sessions.
    - g. Prepare detailed verification and functional performance testing procedure data sheets.
    - h. Conduct verification testing.
    - i. Conduct functional performance testing.
    - j. Re-test if performance deficiencies are found, corrected, and additional testing is requested. Only one retest will be performed. If the issue still remains after the re-test the additional cost to re-test will be incurred by the responsible HVAC Subcontractor. See section 3.3 below for further details.
    - k. Review O&M manuals.
    - l. Perform functional performance testing to accommodate seasonal tests and incorporate the results into the commissioning report.
    - m. Prepare the final commissioning report.
    - n. Assemble the final project documentation which shall include the Commissioning report.
    - o. Perform 10 month warranty walkthrough
  3. Project Manager:
    - a. Assist the Commissioning Agent in establishing the commissioning plan and in maintaining the schedule of commissioning events.
    - b. Attend all commissioning coordination meetings scheduled by the Commissioning Agent.
    - c. Keep the Commissioning Agent apprised of the schedule of work so that the Commissioning Agent can update the commissioning plan as the project progresses.
    - d. Direct General, Mechanical, Electrical, Plumbing, Technology, and Building Envelope Contractors, as required to satisfactorily complete the commissioning process.
  4. General Contractor:

- a. Attend all commissioning coordination meetings scheduled by the Commissioning Agent.
  - b. Direct the Mechanical, Electrical, Plumbing, Technology, and Building Envelope Subcontractors, as required to satisfactorily complete the commissioning process.
  - c. Oversee the installation and placing in service of all building equipment and systems.
  - d. Oversee the performance and documentation of the pre-functional checklists by mechanical, electrical, plumbing, technology, and building envelope contractors, and their subcontractors prior to the beginning of commissioning verification and functional testing of the equipment.
  - e. Respond to issues noted in the Commissioning Agent field and summary reports.
5. Mechanical, Electrical, Plumbing, Technology, and Building Envelope Contractors:
- a. Include cost to complete commissioning requirements for mechanical systems in the contract price.
  - b. Attend commissioning coordination meetings at the discretion of the Commissioning Agent.
  - c. Arrange for various subcontractors and equipment manufacturers to attend commissioning coordination meetings scheduled by the Commissioning Agent, as indicated herein and as required.
  - d. Furnish or arrange for all labor, materials, and special tools and equipment required for execution of the commissioning process.
  - e. Include requirements for submittal data, O&M data, training, and commissioning in each purchase order or sub-contract written.
  - f. Ensure cooperation and participation of specialty subcontractors such as sheet-metal, piping, refrigeration, water treatment, BAS/ATC, TAB, etc.
  - g. Ensure participation of major equipment manufacturers in appropriate training and testing activities.
  - h. Coordinate and provide pre-functional checklist documentation per Section 01 91 13 and the Commissioning Plan as developed by the Commissioning Agent.
  - i. Assist the Commissioning Agent in performing all verification and functional performance tests.
  - j. Respond to issues noted in the Commissioning Agent field and summary reports.
  - k. Prepare a preliminary schedule for mechanical system orientation and inspections, O&M manual submission, training sessions, pipe and duct system testing, flushing and cleaning, equipment start-up, etc., and task completion for use by the Commissioning Agent. Update schedule as appropriate throughout the construction period.
  - l. Gather O&M data on all equipment, and assemble in binders as required by the specifications. Submit to Commissioning Agent prior to the completion of construction. O & M manuals are to be issued to the project team within 60 days of the submittals being approved.
  - m. Notify the Project Manager a minimum of 10 working days prior to start-up of each specific piece of equipment and system start-up, so that observation and testing can occur.
  - n. Participate in, and schedule subcontractors and manufacturers to participate in all training sessions as set up by the Commissioning Agent.
6. Testing, Adjusting, and Balancing (TAB) Subcontractor:
- a. Include cost for commissioning requirements in the contract price.
  - b. Attend initial commissioning coordination meeting scheduled by the Commissioning Agent, and other commissioning coordination meetings, as requested.
  - c. Submit the TAB procedures to the Commissioning Agent for review and acceptance.
  - d. Attend a TAB review meeting scheduled by the Commissioning Agent. Be prepared to discuss the procedures that shall be followed in testing, adjusting and balancing the HVAC system.
  - e. At the completion of the TAB work, and submittal of final TAB report, notify the HVAC Subcontractor and Project Manager.

- f. Participate in verification of the TAB report, which will consist of repeating any selected measurement contained in the TAB report where required by the Commissioning Agent for verification or diagnostic purposes.
- 7. Building Automation System (BAS) Subcontractor:
  - a. Include cost for commissioning requirements in the contract price.
  - b. Attend initial Commissioning coordination meeting scheduled by the Commissioning Agent, and other commissioning coordination meetings as requested.
  - c. Review design for controllability with respect to selected manufacturers equipment;
    - 1) Verify proper hardware specification exists for functional performance required by specification and sequence of operation.
    - 2) Verify proper safeties and interlocks are included in design.
    - 3) Verify proper sizing of control valves and actuators based on design pressure drops. Verify control valve ability to control coil properly.
    - 4) Verify proper sizing of control dampers.
    - 5) Verify proper selection of sensor ranges.
    - 6) Clarify all questions of operation.
  - d. Provide the following information to the Commissioning Agent:
    - 1) Narrative description of each control sequence for each piece of equipment controlled.
    - 2) Diagrams showing all control points, sensor locations, point names, actuators, controllers, etc.
    - 3) A list of all control points, including analog inputs, analog outputs, digital inputs, and digital outputs. Include the values of all parameters for each system point. Provide a separate list for each standalone control unit.
    - 4) Hardware operation and maintenance manuals.
    - 5) Integrate installation and programming schedule with construction and commissioning schedules.
    - 6) Provide thorough training to operating personnel on hardware operations and programming, and the application program for the system.
    - 7) Perform pre-functional checklist of controls on equipment requiring control pre-functional checks.
    - 8) Demonstrate system performance to Commissioning Agent including all modes of system operation (e.g., normal occupied, normal unoccupied, abnormal, emergency).
    - 9) Provide control system technician and instrumentation for use during all system verification and functional performance testing.
    - 10) Provide system modifications as required.
    - 11) Provide support and coordination with TAB Trade on all interfaces between the ATC and TAB scopes of work. Provide all devices, such as portable operator's terminals, for TAB use in completing TAB procedures.
    - 12) Additional trend logs may be required to facilitate the commissioning process.
- 8. Equipment Suppliers and Miscellaneous Subcontractors:
  - a. Include cost for commissioning requirements in the contract price.
  - b. Attend initial Commissioning coordination meeting scheduled by the Commissioning Agent, and commissioning coordination meetings as requested.
  - c. Provide appropriate O&M manual section(s).
  - d. Participate in appropriate training sessions as scheduled by the Commissioning Agent.
  - e. Demonstrate performance of equipment as applicable.

1.06 DOCUMENTATION

- A. The Commissioning Agent shall oversee and maintain the development of commissioning documentation. The commissioning documentation shall be kept in three ring binders, and organized by system and sub-system where practical. All pages shall be numbered, and a table of contents page(s) shall be provided. The Commissioning documentation shall include, but not be limited to, the following:
1. A detailed description of the design intent for the project, listing operating parameters, control sequences, occupancy conditions, etc. (provided by the design engineer).
  2. A complete description of how the HVAC, electrical, plumbing, and fire protection systems are intended to operate (provided by the design engineer).
  3. Approved test and balance report for the building being commissioned.
  4. All verification and functional performance test checklists/results, organized by system and sub-system.

## **PART 2 - PRODUCTS**

### **2.01 SPECIAL TOOLS AND/OR PROPRIETARY TEST EQUIPMENT**

- A. Special tools, proprietary test equipment, and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. A pre-construction meeting of all Commissioning team members shall be held at a time and place designated by the Owner's Project Manager. The purpose shall be to familiarize all parties with the commissioning process, and to ensure that the responsibilities of each party are clearly understood.
1. Two additional "kick-off" meetings will also be held prior to the commissioning functional testing. The second meeting will "kick-off" the pre-functional checklists, initial start-up, and scheduling. The third "kick-off" meeting will be held to discuss and schedule the functional testing, acceptance, training, and turnover.
  2. Additional meetings will be scheduled by the Commissioning Agent as needed to facilitate the commissioning process.
- B. The Mechanical, Electrical, Plumbing, Technology, and Building Envelope Subcontractors shall complete all phases of work so the systems can be started, tested, balanced, and commissioning procedures undertaken. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc., per the contract documents and related directives, clarifications, and change orders.
- C. Commissioning procedures may begin prior to completion of a system and/or sub-systems, and shall be coordinated with the Commissioning Agent. Start of commissioning procedures before system completion does not relieve the Mechanical, Electrical, Plumbing, Technology, and Building Envelope Contractors, from completing those systems as per the contract requirements.

### **3.02 PARTICIPATION IN ACCEPTANCE PROCEDURES**

- A. The Mechanical, Electrical, Plumbing, Technology, and Building Envelope Contractors, shall provide skilled technicians to support startup, testing, and debugging all systems within their respective specification sections and divisions. These same technicians shall be made available as necessary to assist the Commissioning Agent in executing the commissioning program. Work schedules, time required for testing, etc., shall be requested by the Commissioning Agent and coordinated by the Mechanical, Electrical, Plumbing, Technology, and Building Envelope Contractors,

- B. System performance problems and discrepancies may require additional technician time, Commissioning Agent time, reconstruction of systems, and/or replacement of system components. The additional technician time shall be made available for subsequent commissioning periods until the required system performance is obtained.

### 3.03 DEFICIENCY RESOLUTION

- A. In some systems, maladjustments, misapplied equipment, and deficient performance under varying loads will result in additional work being required to re-commission the systems. This work will be completed under the direction of the Project Manager, with input from the Commissioning Agent and Design Engineer. All Commissioning Team members will have input and the opportunity to discuss the work and resolve problems.
- B. Corrective work shall be completed in a timely fashion to permit timely completion of the commissioning process. Experimentation to render system performance will be permitted. If the Commissioning Agent deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Commissioning Agent will notify the Project Manager indicating the nature of the problem and expected steps to be taken.
- C. The cost for the Trade contractors to retest a prefunctional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the CM/GC.
- D. For a deficiency identified, not related to any prefunctional checklist or start-up fault, the following shall apply: The CxA will direct the retesting of the equipment once at no "charge" to the CM/GC for their time. However, the CxA's and owner's time for a second retest will be charged to the CM/GC, who may choose to recover costs from the responsible contractor or subcontractor. Before retesting occurs, the CM/GC will inspect the deficiency and respond to the CxA that the issue has been addressed.
- E. The time for the CxA and owner to direct any retesting required because a specific prefunctional checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be back charged to the CM/GC, who may choose to recover costs from the party responsible for misinformation or deficiency.
- F. The Trade Contractors shall respond in writing to the CxA and owner at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
- G. Any required retesting by any Trade contractor shall not be considered a justified reason for a claim of delay or for a time extension by the CM/GC, contractors or subcontractors.

### 3.04 SEASONAL COMMISSIONING

- A. Seasonal commissioning pertains to testing close to full load conditions during peak heating and peak cooling seasons, as well as part load conditions in the spring and fall. Initial commissioning shall be done as soon as contract work is completed, regardless of season.
- B. Heating equipment shall be tested during heating season. Cooling equipment shall be tested during cooling season with a normal level of building occupancy. Each HVAC Subcontractor and supplier shall be responsible to participate in the initial and the alternate peak season tests of the systems as required in order to demonstrate performance.

### 3.05 OPERATING AND MAINTENANCE (O&M) TRAINING

- A. Training: Comprehensive training of Owner's maintenance personnel shall be performed by the Mechanical, Electrical, Plumbing, Technology, and Building Envelope Contractors, with assistance and input from the Commissioning Agent, and where appropriate, by subcontractors, and equipment manufacturers.
  - 1. Training shall be on-site and/or at other mutually agreed to places. Training shall begin prior to turnover of building to the Owner, and shall continue for a reasonable period of time after turnover.
  - 2. It is anticipated that training will be provided in multiple sessions as noted in the project specifications. The quantity of sessions will be clarified in various equipment/systems project specifications.

3. The training shall include hands-on O & M instruction on the installed equipment and systems to be provided by the various MEP and Building Enclosure Subcontractors or their representatives. The training shall emphasize operating instructions, and preventive maintenance as described in the operation and maintenance (O&M) manuals. The O & M manuals can be reviewed during the training sessions with the training representative in greater detail as desired by the Owner. The training period shall include an onsite inspection, explanation, and review of the systems encompassed by the commissioning process and is to be delivered by the Trade Subcontractors.
  4. Training requirements are partially specified in this specification section, and further specified in other specification sections.
- B. The Mechanical, Electrical, Plumbing, Technology, and Building Envelope Contractors, shall be responsible for organizing, arranging, and delivering this instruction in an efficient and effective manner on a schedule agreeable to the Commissioning Agent and the Owner.
- C. The Mechanical, Electrical, Plumbing, Technology, and Building Envelope Contractors, shall provide, well before substantial completion, a proposed agenda and schedule for training for approval by the Commissioning Agent and the Owner.
- D. Training shall include:
1. Use of the printed installation, operation, and maintenance instruction material included in the O&M Manuals.
  2. Include a review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include review of start-up, operation in all modes possible, shutdown, seasonal changeover and any emergency procedures.
  3. Discuss relevant health and safety issues and concerns.
  4. Discuss warranties and guarantees.
  5. Cover common troubleshooting problems and solutions.
  6. Explain information included in the O&M manuals and the location of all plans and manuals in the facility.
  7. Discuss any peculiarities of equipment installation or operation.
  8. Any classroom sessions provided may include the use of overhead projections, slides, video and audio taped material as required by specifications.
- 3.06 START-UP, PRE-FUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT
- A. The following procedures apply to all equipment to be commissioned, according to Section 1.4, Scope of Work. Some systems that are not comprised so much of actual dynamic machinery may have very simplified PCs and startup.
1. General:
    - a. Pre-functional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full pre-functional checkout. The pre-functional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.
  2. Start-up and Initial Checkout Plan:
    - a. The CxA shall assist the commissioning team members responsible for startup of any equipment in developing detailed start up plans as required for all equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been completed. Parties responsible for pre-functional checklists and startup are identified in the commissioning scoping meeting and the commissioning plan.
    - b. Checklists generated by the CxA are provided to the applicable Trade contractor for informational purposes.

- c. The Trade Contractor responsible for the purchase of the equipment develops the full start up plan by combining (or adding to) the CxA's checklists with the manufacturer's detailed start up and checkout procedures from the O&M manual and the normally used field checkout sheets.
  - 1) The full start up plan could consist of something as simple as:
    - a) The CxA's pre-functional checklists.
    - b) The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
    - c) The manufacturer's normally used field checkout sheets.
- d. The Trade contractor submits the full startup plan to the CxA for review and approval as required in the project specifications.
- e. The CxA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.

3.07 DOCUMENTATION, FUNCTIONAL PERFORMANCE TESTING

- A. Documentation: The CxA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the Project Manager and to the Subs for informational purposes. The CxA will include the filled out forms in the final commissioning report.



B. Non-Conformance:

1. The CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the Project Manager on a standard noncompliance form.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Owner.
4. As tests progress and a deficiency is identified, the CxA will discuss the issue with the executing contractor.
  - a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:
    - 1) The CxA documents the deficiency and the Subcontractor's response and intentions and they go on to another test or sequence. Subsequently, the Sub corrects the deficiency, notifies the Project Manager and Commissioning Agent that the equipment is ready to be retested. The Commissioning Agent then retests the deficient system/component and documents the results.
    - 2) This process is repeated until the discrepancy is appropriately resolved. See section 3.3 above with regards to re-testing more than one time and potential cost overruns.
  - b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
    - 1) The deficiency shall be documented with the Sub's response and a copy given to the Project Manager.
    - 2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Owner.
    - 3) The CxA documents the resolution process.
    - 4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, and notifies the Project Manager and the Commissioning Agent. The Commissioning Agent reschedules the test and the test is repeated until satisfactory performance is achieved.
5. The Trade Contractors shall respond in writing to the Commissioning Agent and Project Manager at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements, proposals for their resolution, and current status of completion.
6. The Commissioning Agent retains the original discrepancy documentation until the end of the project.

**END OF SECTION**

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Section 03 30 00

CAST-IN-PLACE CONCRETE

**PART 1 GENERAL**

**1.01 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

**1.02 DESCRIPTION OF WORK**

- A. Work Included: This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes. Cast-in-place concrete shall include, but not be limited to the following:
1. Equipment pads and bases. Housekeeping pads.
  2. Concrete thrust and anchor blocks.
  3. Exterior pads for HVAC and electrical equipment.
  4. Exterior concrete steps.
  5. Exterior concrete sidewalks where indicated.
  6. Concrete for miscellaneous items: flagpoles, exterior equipment relocation, etc.
  7. Miscellaneous concrete for fills and encasement.
  8. Exterior concrete retaining walls and bases.
- B. Alternates: Special attention is called to the fact that it shall be the responsibility of all the General and Subcontractors to thoroughly examine all the alternates and evaluate for themselves as to whether or not these alternates in any way affect their respective section. In the event that a Contractor feels that any alternate(s) do reflect a cost difference, additional or a deduction in his bid proposal, then he shall so stipulate this sum and/or sums under the proper alternate(s) as provided for the bid proposals. Failure to do so will in no way relieve the hereinbefore stated contractors of their responsibilities regardless of what alternate(s) are selected at no extra cost will be charged to the Owner. Refer to Section 01 23 00, ALTERNATES for the list and description of Alternates.
- C. Items To Be Installed Only: Not Applicable
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. Section 01 45 00, QUALITY CONTROL.
  2. Section 01 45 29, TESTING LABORATORY SERVICES
  3. Section 01 45 90, PROGRAM OF STRUCTURAL TESTS AND INSPECTIONS, Program of Structural Tests and Inspections, Schedule of Tests and Inspections
  4. Section 31 20 10, EARTH MOVING; Excavation and establishment of subgrade elevations, site preparation.
  5. Section 03 05 13, CONCRETE SEALERS.
  6. Section 06 10 00, ROUGH CARPENTRY.

### 1.03 SUBMITTALS

- A. Refer to Section 01 33 00, SUBMITTAL PROCEDURES for submittal provisions and procedures.
- B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, water-stops, joint systems, curing compounds, dry-shake finish materials, and others if requested by the Architect or SER.
- C. Shop drawings for reinforcement detailing, fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement.
  - 1. All reinforcing shop drawings for concrete walls shall be shown on walls elevations with a scale of 1/4 in. = 1 ft. - 0 in.
  - 2. Include special reinforcing required for openings through concrete structures.
- D. Electronic Submittals: Refer to Section 01 33 00 for Submittal Procedure. In addition, provide Engineer (1) fullsize paper print of each shop drawing, in addition to the electronic submittal. Paper copy will be retained by the Engineer and electronic copy will be returned. Review cycle will not commence until paper copy of shop drawing has been received.
- E. Concrete mix design for each mix specified. Supporting test data shall be submitted if requested.
- F. Proposed method of curing concrete and associated products.
- G. Proposed precautions for hot weather and cold weather concreting.
- H. Samples of materials as requested by Architect, including names, sources, and descriptions.
- I. Laboratory test reports for concrete materials and mix design test.
- J. Description of Methods and Sequence of Placement. For each type of specially-finished concrete provide description of methods and sequence of placement.
- K. Material certificates in lieu of material laboratory test reports when permitted by Architect. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

### 1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where requirements that are more stringent are shown or specified:
  - 1. Massachusetts State Building Code, Current Edition.
  - 2. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings".

3. ACI 318, "Building Code Requirements for Reinforced Concrete".
4. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice".
5. Manual of Standard Practice for Detailing Reinforced Concrete Structures ACI 315.
6. ACI 308, "Recommended Practice for curing Concrete"
7. ASTM C 94, Ready-Mixed Concrete.

B. Inspection, Testing, and Quality Control

1. A Program of Inspection and Testing of cast-in-place concrete work will be established by the Structural Engineer of Record (SER) who will direct the implementation of tests as carried out by an Independent Testing Agency, under a separate contract with the Owner. Materials and workmanship shall be subjected to inspection and testing in mill, shop, and/or field by the SER and/or Testing Agency. Such inspection and testing shall not relieve the Contractor of his responsibility to provide his own inspection, testing, and quality control as necessary to furnish materials and workmanship in accordance with requirements of Contract Documents.
2. The General Contractor shall notify the SER and the Testing Agency prior to start of any phase of concrete work so as to afford them reasonable opportunity to inspect the work. Such notification shall be made at least 24 hours in advance.

C. Project Data:

1. Concrete Curing and Protection: Submit to the Architect/SER in accordance with the requirements of Contract Documents, detailed methods proposed for use for curing and protection prior to commencement of concrete work. This shall include winter protection and hot weather concrete methods.

D. Preconstruction Conference. Attend a preconstruction conference prior to the start of architectural concrete construction as directed by the Owner's Representative and the Architect. Discussion will include the following:

1. The Contractor's program to obtain the specified quality of architectural concrete.
2. The procedures and methods for construction of preconstruction mock-ups specified herein.

## 1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products in accordance with Section 01 60 00, PRODUCT REQUIREMENTS.

1. Reinforcing steel and other items to be embedded in cast-in place concrete which are stored at the project site shall be above ground on platforms, skids or other supports, protected from the elements by a waterproof covering ventilated to prevent condensation.

B. General Contractor shall provide and pay for all dumpster services during the entire construction period. Suppliers and Sub-Contractors to bring all rubbish and debris to the dumpster location daily. No costs are to be assessed to the suppliers or Sub-Contractors by the General Contractor for this service.

- C. General Contractor, Sub-Contractors, and suppliers are all individually to furnish their own staging, scaffolding, and hoisting equipment necessary to get workers, material, and equipment from the point of delivery at the project site to the point of use or installation within the building and project site. All crane and rigging services required are the responsibility of each individual trade.

## **PART 2 PRODUCTS**

### **2.01 FORM MATERIALS**

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
  - 1. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- B. Forms for Exposed Finish Concrete Site Structures (Walls, Stairs, Misc. Structures): Form-facing panels for as-cast finishes.
  - 1. Steel, glass-fiber-reinforced plastic, high density overlay, Class 1, or better, Finnish phenolic overlaid birch plywood or other approved non-absorptive panel materials that will provide continuous, true, and smooth architectural concrete surfaces in accordance with ACI 303.1. Furnish in largest practicable sizes to minimize the number of joints.
  - 2. Formwork shall produce an extremely smooth finish as displayed in approved mock-up.
- C. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two (2) edges and one (1) side for tight fit.
- D. Chamfer strips shall be wood, PVC or rubber strips.
- E. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 mg/l volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
  - 1. Formulate form release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties for Concrete Below Grade or Areas Not Exposed to View: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal.
  - 1. Provide ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.

### **2.02 METAL REINFORCING MATERIALS**

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

- B. Steel Wire: ASTM A 82, plain, cold-drawn steel, Refer to "Special Requirements for Architecturally Exposed Concrete" for required stainless steel wire.
- C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric. All welded wire fabric shall be supplied in flat sheets.
- D. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.
  - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs. Concrete bricks may be used to support reinforcing steel where application allows.

## 2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II.
- B. Normal-Weight Aggregates: ASTM C 33 and as specified.
- C. Water: Potable.
- D. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.
- E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- F. Water-Reducing Admixture: ASTM C 494, Type A.
- G. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.
- H. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.
- I. Water-Reducing, Accelerating Admixture: ASTM C494, Type E.

## 2.04 RELATED MATERIALS

- A. Water-stops: Provide flat, dumbbell-type or center-bulb-type water-stops at construction joints and other joints as indicated. Size to suit joints.
- B. Polyvinyl Chloride Water-stops: Corps of Engineers CRD-C 572.
- C. Sand Cushion: Clean, manufactured, or natural sand.
- D. Vapor Retarder: Refer to Section 07 26 00 for vapor retarder.
- E. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- F. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
  - 1. Water proof paper.
  - 2. Polyethylene film.

- 3. Polyethylene coated burlap.
- G. Liquid Membrane-Forming Curing Compound: Liquid-type membrane-forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than 0.55 kg/sq. meter when applied at 200 sq. ft./gal.
- H. Evaporation Control: Mono-molecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
- I. Underlayment Compound: Free-flowing, self-leveling, pumpable, cement-based compound for applications from one (1) inch thick to feathered edges.
- J. Bonding Agent: Polyvinyl acetate or acrylic base.
- K. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.
- L. Epoxy Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- M. Clear Penetrating Sealer for Concrete: Refer Section 03 05 13, CONCRETE SEALERS.

## 2.05 PROPORTIONING AND DESIGNING MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- B. Submit written reports to Architect of each proposed mix for each class of concrete at least fifteen (15) days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Architect/SER
- C. Footings: Proportion normal-weight concrete with the following properties:
  - 1. Compressive Strength (28 Days): 3000 psi.
  - 2. Maximum Slump: 4 inches at point of discharge (at the truck).
  - 3. Slump may be increased to 6 inches with use of Mid-Range Water Reducing Admixture. (After Field verification of original slump limit)
  - 4. Maximum water-cement ratio: 0.55
  - 5. No substitution of other cementitious materials for Portland Cement.
- D. Foundation Walls: Proportion normal-weight concrete with the following properties:
  - 1. Compressive Strength (28 Days): 4000 psi.
  - 2. Maximum Slump: 3 inches at point of discharge (at the truck).
  - 3. Slump may be increased to 6 inches with use of Mid-Range Water Reducing Admixture. (after Field verification of original slump limit)
  - 4. Air-entrained
  - 5. Maximum water-cement ratio: 0.48
  - 6. No substitution of other cementitious materials for Portland Cement.



- E. Exterior Walks, Aprons, Stairs, Ramps, and Miscellaneous Exterior Structures: Proportion normal-weight concrete with the following properties:
  - 1. Compressive Strength (28 Days): 4000 psi
  - 2. Maximum Slump: 4 inches at point of discharge (at the truck).
  - 3. Slump may be increased to 6 inches with use of Mid-Range Water Reducing Admixture. (after Field verification of original slump limit)
  - 4. Air-entrained
  - 5. Maximum water-cement ratio: 0.44
- G. Under no conditions shall water be added to the concrete mixes at the site.
- H. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by SER. Laboratory test data for revised mix design and strength results must be submitted to and accepted by SER before using in Work.
- I. All pumped concrete shall contain mid-range water reducing admixture or high range water reducing admixture (superplasticizer) added at the site. Maintain slumps as specified above

## 2.06 ADMIXTURES

- A. Use mid-range water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for pumping, placement and workability.
- B. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.
- C. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within the following limits:
  - 1. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or hydraulic pressure: 5.0 percent (moderate exposure); 6.0 percent (severe exposure) for 3/4-inch maximum aggregate.
- D. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

## 2.07 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.
  - 1. When air temperature is between 85 degrees F and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to seventy-five 75 minutes, and when air temperature is above 90 degrees F, reduce mixing and delivery time to sixty (60) minutes.

### **PART 3 EXECUTION**

#### **3.01 GENERAL**

- A. Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel.

#### **3.02 FORMS**

- A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347.
- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal. Use 6 mil poly to cover rustication keyways to ensure easy removal without chipping concrete.
- D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

#### **3.03 PLACING REINFORCEMENT**

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports and as specified.

1. Avoid cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Architect.
- D. Place reinforcement to maintain minimum coverage as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Install flat welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one (1) full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

#### 3.04 JOINTS

- A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Architect.
- B. Provide keyways at least 1-1/2 inches deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise.
- D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- E. Water-stops: Provide water-stops in construction joints as indicated. Install water-stops to form continuous diaphragm in each joint. Support and protect exposed water-stops during progress of Work. Field-fabricate joints in water-stops according to manufacturer's printed instructions.
- F. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated. Joint fillers and sealants are specified under Division 7.
- G. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels or patterns as shown. Use a "Soff-Cutt", or approved equal, saw for cuts 1/8 inch wide by one-fourth of slab depth or inserts 1/4 inch wide by one-fourth of slab depth, except use 1/4 inch wide sawn joints for joints filled with epoxy joint filler. Saw cutting shall begin immediately after final finishing.
  1. Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool

slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.

2. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
3. If joint pattern is not shown, provide joints not exceeding fifteen (15) feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays). Joint fillers and sealants are specified under Division 7.

### 3.05 INSTALLING EMBEDDED ITEMS

- A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.
- B. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

### 3.06 PREPARING FORM SURFACES

- A. General: Coat contact surfaces of forms with an approved, non-residual, low-VOC, form-coating compound before placing reinforcement.
- B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.
  1. Coat steel forms with a non-staining, rust-preventative material. Rust-stained steel formwork is not acceptable.

### 3.07 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete", and as specified.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.
- D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than twenty-four (24) inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
  2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least six (6) inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.
- E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.
1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
  2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
  3. Maintain reinforcing in proper position on chairs during concrete placement.
- F. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at point of placement.
1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
  3. Cover walls and slabs with thermal blankets. Provide poly tents with heat for twenty-four (24) hours when temperature is 40 degrees F or below.
- G. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 degrees F. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
  3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.
  4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

### 3.08 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
- B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.
- C. Smooth-Rubbed Finish: Provide smooth-rubbed finish on scheduled concrete surfaces that have received smooth-formed finish treatment not later than one (1) day after form removal.
  - 1. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Grout-Cleaned Finish: Provide grout-cleaned finish on scheduled concrete surfaces that have received smooth-formed finish treatment.
  - 1. Combine one part portland cement to one and one-half parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to form the consistency of thick paint. Blend standard Portland cement and white Portland cement in amounts determined by trial patches so that final color of dry grout will match adjacent surfaces.
  - 2. Thoroughly wet concrete surfaces, apply grout to coat surfaces, and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least thirty-six (36) hours after rubbing.
- E. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.09 MONOLITHIC SLAB FINISHES

- A. Non-slip Broom Finish: Apply a non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
  - 1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- B. Non-slip Aggregate Finish: Apply non-slip aggregate finish to concrete stair treads, platforms, ramps, sloped walks.

1. After completing float finishing and before starting trowel finish, uniformly spread 25 lbs. of dampened non-slip aggregate per 100 sq. ft. of surface. Tamp aggregate flush with surface using a steel trowel, but do not force below surface. After broadcasting and tamping, apply trowel finishing as specified.
2. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose non-slip aggregate.

### 3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and trowel-finish concrete surfaces.

### 3.11 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting; keep continuously moist for not less than seven (7) days.
- C. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.
- D. Provide moisture curing by the following methods:
  1. Keep concrete surface continuously wet by covering with water.
  2. Use continuous water-fog spray.
  3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a four (4) inch lap over adjacent absorptive covers.
- E. Provide moisture-retaining cover curing as follows:

1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least three (3) inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- F. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:
1. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within two (2) hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within three (3) hours after initial application. Maintain continuity of coating and repair damage during curing period.
  2. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.
- G. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- H. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.
1. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

### 3.12 REMOVING FORMS

- A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for twenty-four (24) hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

### 3.13 REUSING FORMS

- A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Architect.

### 3.14 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Architect.



1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than one (1) inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
  2. For surfaces exposed to view, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- B. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.
1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.
- C. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.
1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
  2. Correct high areas in unformed surfaces by grinding after concrete has cured at least fourteen (14) days.
  3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.
  4. Repair defective areas, except random cracks and single holes not exceeding one (1) inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- D. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.

- E. Repair methods not specified above may be used, subject to acceptance of Architect.

### 3.15 THRUST AND ANCHOR BLOCKS

- A. Minimum bearing areas for thrust blocks and dimensions of anchor blocks will be as shown on the Drawings.
- B. Concrete for thrust and anchor blocks will be placed against undisturbed earth, and wooden side forms will be used to provide satisfactory lines and dimensions. Felt roofing paper will be placed to protect the joints. No concrete will be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints.

### 3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. An independent Testing Laboratory, chosen by the Owner, will be retained for this project to perform such laboratory services as are required. The engagement of this laboratory will in no way relieve the Contractor of his responsibility to furnish materials and construction in conformance with the drawings and specifications.
- B. Sampling and testing for quality control during concrete placement may include the following, as directed by Architect.
  - 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
    - a. Slump: ASTM C 143; one (1) test at point of discharge (at the truck before adding plasticizers) for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
    - b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one (1) for each day's pour of each type of air-entrained concrete.
    - c. Concrete Temperature: ASTM C 1064; one (1) test hourly when air temperature is 40 degrees F and below, when 80 degrees F and above, and one (1) test for each set of compressive-strength specimens
    - d. Compression Test Specimen: ASTM C 31; one (1) set of four (4) standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
    - e. Compressive-Strength Tests: ASTM C 39; one (1) set for each day's pour exceeding five (5) cu. yds. plus additional sets for each fifty (50) cu. yds. more than the first twenty-five (25) cu. yds. of each concrete class placed in any one (1) day; one specimen tested at seven (7) days, two specimens tested at twenty-eight (28) days, and one specimen retained in reserve for later testing if required.
  - 2. When frequency of testing will provide fewer than five (5) strength tests for a given class of concrete, conduct testing from at least five (5) randomly selected batches or from each batch if fewer than five (5) are used. When total quantity of a given class of concrete is less than fifty (50) cu. yds., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
  - 3. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

4. Strength level of concrete will be considered satisfactory if averages of sets of three (3) consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
- C. Test results will be reported in writing to Architect, Structural Engineer, ready-mix producer, and Contractor within twenty-four (24) hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at twenty-eight (28) days, concrete mix proportions and materials, compressive breaking strength, and type of break for both seven (7) day tests and twenty-eight (28) day tests.
- D. Any material or workmanship that is rejected by the SER and/or the Testing Agency either at the plant or at the job site, shall be replaced promptly by the Contractor to the satisfaction of the SER at no expense of the Owner.
- E. Non-destructive Testing: Impact hammer, sonoscope, or other non-destructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- F. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION

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Section 06 10 00  
ROUGH CARPENTRY

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. The work of this Section consists of rough carpentry where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, but is not limited to the following.
- B. Furnish and install the following:
  - 1. Wood vehicular guardrails.
  - 2. Temporary entrances including tube footings, wood stairs, metal railings, roof canopies and asphalt shingle roofing for Site Enabling Work indicated on the Drawings.
  - 3. Stage flooring.
  - 4. Fire retardant treated (FRT) plywood backer panels for mounting of electrical panelboards, telephone/data backboards, HVAC and fire control equipment and other equipment.
  - 5. Backing panels at utility closets.
  - 6. Backer rod and AVB membrane for connection to exterior hollow metal frames for doors.
  - 7. Various wood blockings, edgings, nailers, curbs, cants, grounds, furring, sheathing, framing members including wood preservative or fire retardant treatment as indicated, as required for receipt of various finishes and surfacing materials, not described herein above.
    - a. Curtain wall, windows, louvers and doors.
    - b. Roofing system, edges, curbs, openings, blocking at roof drains.
    - c. Blocking for roof access ladders.
    - d. Door hold open devices, all wall door stops, all hardware and other attached items.
    - e. Provide exterior grade fire rated blocking at exterior canopies.
  - 8. Temporary barriers, rough hardware, and required railings, supports, environmental barriers and related required temporary construction required, and for the phasing and work controls.
  - 9. Rough installation hardware, including bolts, screws, spikes, nails, clips, and connection assemblies, as needed for installation of the rough carpentry work.
    - a. All construction including materials and systems, on exterior side of air/vapor barrier shall be considered exterior and be attached with stainless steel or corrosive resistant fasteners. Fasteners sized over ½ inch in diameter may be hot-dip galvanized.
- C. Install the following furnished under the designated Sections:
  - 1. Metal door frames furnished under Section 08 11 13 - HOLLOW METAL DOORS AND FRAMES.

- a. Place frames and erect in correct positions within specified tolerances. Additionally provide temporary bracing at locations where frames are indicated to be built-into masonry. Section 04 20 00 - UNIT MASONRY shall grout frames and "build-into" into masonry work.
  2. Metal door frames furnished under Section 08 12 16 - ALUMINUM FRAMES.
    - a. Place frames and erect in correct positions within specified tolerances. Additionally provide temporary bracing at locations where frames are indicated to be built-into masonry. Section 04 20 00 - UNIT MASONRY shall grout frames and "build-into" into masonry work.
  3. Concealed anchorage devices for handicap handrails in toilet rooms: Section 10 28 13 - TOILET ACCESSORIES.
  4. Mineral wool insulation at hollow metal and overhead door frame perimeter furnished under Section 07 21 00 - THERMAL INSULATION.
  5. Bent steel roof edge and clip angles at canopies and sunshades furnished under section 05 50 00 - METAL FABRICATIONS.
- D. Coordinate work of this Section with the work of the various trades responsible for applying finish materials and other items to rough carpentry work. Furnish and install furring, blocking, and shims, and other usual items of normal rough carpentry work as required by the various trades for the proper completion of the project.
1. The applicable requirements specified in Part 1 - GENERAL and Part 3 - EXECUTION of the individual specification sections furnishing materials to be installed under this Section, shall be included in and made a part of this Section.
- E. No attempt is made in this Section to list all elements of rough carpentry required on this project or to describe how each element will be installed. It is the responsibility of the Contractor to determine for itself the scope and nature of the work required for a complete installation from the information provided herein and in the Drawings.
- F. Alternates: Special attention is called to the fact that it shall be the responsibility of the Construction Manager, Trade Contractors and all subcontractors to thoroughly examine all the alternates and evaluate for themselves as to whether or not these alternates in any way affect their respective section. In the event that the Construction Manager, Trade Contractor or subcontractor feels that any alternate(s) do reflect a cost difference, additional or a deduction in his bid proposal, then he shall so stipulate this sum and/or sums under the proper alternate(s) as provided for the bid proposals. Failure to do so will in no way relieve the hereinbefore stated Construction Manager, Trade Contractor or subcontractors of their responsibilities regardless of what alternate(s) is selected. No extra cost will be charged to the Owner. Refer to Section 01 23 00 - ALTERNATES for the list and description of Alternates.

## 1.2 RELATED REQUIREMENTS

- A. Section 01 18 13 - SUSTAINABLE DESIGN REPORTING: Special administrative and procedure requirements related to the Owner's *LEED v4, LEED for Building Design and Construction, LEED BD+C: Schools* rating system certificate goals of energy conservation and efficiency, indoor air quality, and natural resource efficiency.

- B. Section 01 43 39 - MOCKUPS: Requirements for exterior wall mock-up assembly requiring work of this Section.
- C. Section 01 60 00 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
- D. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT: Procedural and administrative requirements for construction and demolition recycling.
- E. Section 01 81 19 – INDOOR AIR QUALITY REQUIREMENTS.
- F. Section 04 20 00 - UNIT MASONRY: Building-into masonry hollow metal door frames, placed and braced under this Section 06 10 00 - ROUGH CARPENTRY.
- G. Section 05 12 00 - STRUCTURAL STEEL FRAMING: Structural steel framing.
- H. Section 06 20 00 - FINISH CARPENTRY: Wood interior and exterior trim.
- I. Section 06 40 00 - ARCHITECTURAL WOODWORK: Laminate clad casework and countertops.
- J. Section 07 21 00 - THERMAL INSULATION: Thermal insulation between framing, and vapor barrier.
- K. Section 07 54 19 – POLYVINYL-CHLORIDE (PVC) ROOFING: Furnishing and installation of roof nailers and blocking under this Section 06 10 00 – ROUGH CARPENTRY.
- L. Section 07 62 00 - SHEET METAL FLASHING AND TRIM: Flashing, gutters and miscellaneous sheet metal work.
- M. Section 08 11 13 - HOLLOW METAL DOORS AND FRAMES: Furnishing hollow metal framing.
- N. Section 09 22 16 - NON-STRUCTURAL METAL FRAMING: Metal framing for drywall construction.
- O. Section 09 29 00 - GYPSUM BOARD: Wallboard construction work, having taped and compounded joint finish.
- P. Section 09 91 00 - PAINTING: Applied primer and finish coatings to exposed to view rough carpentry work.
- Q. Section 10 28 13 - TOILET ACCESSORIES: Providing anchorage devices and mounting templates for toilet accessories.
- R. Section 12 30 00 - CASEWORK: Manufactured casework.
- S. Section 12 35 53 – LABORATORY CASEWORK: Manufactured science casework.
- T. Division 26 - ELECTRICAL: Providing and mounting electrical panels and equipment.

### 1.3 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
1. APA - applicable grades and specifications.
  2. APA PRB-108 Performance Standards and Policies for Structural-Use Panels.
  3. ANSI A250.11 (formerly SDI 105) - Recommended Erection Instructions for Steel Doors and Frames.
  4. ASTM D 3201 - Test Method for Hygroscopic Properties of Fire-Retardant Wood.
  5. AWPAs Standards and references for preservative treated wood including Standards UC1, UC2, UC3A, UC3B, UC4A, and P5
  6. AWPAs Standard UCFA – Fire Protection as Required by Codes Above Ground Interior Construction.
  7. AWPAs Standard UCFB – Fire Protection as Required by Codes Above Ground Exterior Construction.
  8. AWPAs M4 – Care Of Preservative Treated Wood Products.
  9. FSC (Forest Stewardship Council): “FSC Certification Program”
  10. NER-643: ACQ Preserve® and ACQ Preserve Plus® Wood Preservative Treatment, ICBO Evaluation Service.
  11. MIL L-1914OE - Lumber and Plywood, Fire Retardant Treated.
  12. SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
  13. SPIB Grading Rules, current edition.
  14. UL - Building Materials Directory
  15. US. Department of Commerce Voluntary Product Standard PS1 for Construction and Industrial Plywood.
  16. US. Department of Commerce Voluntary Product Standard PS2 for Wood-Based Structural-Use Panels.
  17. US. Department of Commerce Voluntary Product Standard PS-20 - American Softwood Lumber Standard.
  18. U.S. Department of Commerce Simplified Practice Recommendation R-16, for sizes and use classifications of lumber
  19. American Lumber Standards Committee, National Lumber Grades Authority for Canadian Lumber, and applicable grading rules and standards of the various lumber associations whose species are being used for grades specified.

### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate the work of this Section with the respective trades responsible for locating anchorages installed into blocking which is provided under this Section.



2. Coordinate work of this Section with the work of the various trades responsible for applying finish materials and other items to rough carpentry work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.

## 1.5 SUBMITTALS

- A. Information and Review Submittals: Submit the following under provisions of Section 01 33 00 - SUBMITTAL PROCEDURES:
  1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties and installation instructions for products specified herein.
  2. Certificates: Wood products lacking acceptable documentation for the following will be rejected and their removal required.
    - a. Chain-of-Custody: Written documentation providing evidence of compliance with Chain-of-Custody supply of wood products, and compliance with FSC standards.
      - 1) Demonstrate that products are FSC-certified by providing vendor invoices. Invoices will contain the vendor's chain of custody number and identify each chain of custody certified product on a line-item basis. A "vendor" is defined as the company that furnishes wood products to project contractors and/or subcontractors for on-site installation.
    - b. Composite Wood and Agrifiber Products Include certification indicating compliance with the testing and product requirements of the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda for all composite wood and agrifiber products.
    - c. Written certification from the respective treatment plants indicating types of wood preservative treatment and fire retardant treatment used, treatments method, applications instructions, and conformance to the requirements specified herein.
      - 1) Provide certification that fire retardant treatment materials do not contain ammonium phosphate.
      - 2) Provide report from ICC Evaluation Service on fire retardant treated wood flame spreading, strength, corrosion and hygroscopic properties.
      - 3) Provide report from ICC Evaluation Service on pressure preservative treated wood strength, corrosion, anti-fungi, and anti-insect properties.
  3. LEED Submittal Requirements:
    - a. Submit completed LEEDv4 Materials Reporting for applicable material requirements as required in Section 01 81 13 – SUSTAINABLE DESIGN REQUIREMENTS. Submit all required backup documentation.
    - b. The work of this Section includes responding to Architect or Contractor requests for additional information or product data and may be required following initial Green Building Certification Institute (GBCI) review of LEED Application.

- c. Product substitution requests are subject to additional LEED submittal requirements including, but not limited to, Environmental Product Declarations (EPD), Health Product Declarations (HPD), and General Emissions Testing. See Section 01 25 13 – PRODUCT SUBSTITUTION PROCEDURES.
- d. Include submittal documentation requirements for IEQ Credit 2 Low Emitting Materials, On-Site Wet-Applied Products (paints, coatings, sealants and adhesives), to provide both CDPH Standard Method v1.1 – 2010 emissions compliance and VOC compliance in accordance with SCAQMD Rule 1113 – June 3, 2011 (paints and coatings), and/or SCQMD Rule 1168 – July 1, 2005 (adhesives and sealants). Products tested/certified under the following programs will meet the emissions requirement: FloorScore; SCS Indoor Advantage Gold; UL Greenguard Gold.
- e. Include submittal documentation requirements for IEQ Credit 2 Low Emitting Materials; Composite Wood and Batt Insulation Products to demonstrate compliance with California Air Resources Board (CARB) ATCM for ultra-low emitting formaldehyde (ULEF) resins or no-added formaldehyde (NAF) resins.
- f. Include submittal documentation requirements for MR Credit 3 Building Product Disclosure and Optimization – Sourcing of Raw Materials for certified wood.
- g. Include submittal documentation requirements for MR Credit 2 Building Product Disclosure and Optimization – Environmental Product Declaration for EPDs.

#### 1.6 QUALITY ASSURANCE

- A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
  - 1. All lumber shall:
    - a. Be new, dressed four sides (S4S), clear and free from warping and other defects.
    - b. Have a moisture content not exceeding 19 percent when delivered to the project.
    - c. Be in accordance with the grading rules of the lumber manufacturer's association under whose jurisdiction the lumber is produced and bear the mark of grade and mill identification.
- B. Certifications:
  - 1. All wood products furnished under this Specification Section shall be "FSC Certified" according to the rules of the Forest Stewardship Council (FSC).
    - a. FSC Certification includes the following certification bodies of forests and forest products:
      - 1) SCS Global Services.
      - 2) SmartWood.
      - 3) SGS Qualifor.
      - 4) Soil Association.

2. Plywood: Conform to the requirements of Product Standard PS-1, and bear applicable APA grade trademarks.
  - a. Plywood for electrical boards treated for retardance, meet Class I or a flame spread rating of 25 or less and bear U.L. label "Classified FRS".

#### 1.7 MOCK-UP

- A. Provide mock-up elements for field panel in accordance with Section 01 43 39 – MOCKUPS at exterior location where directed by Architect. Mock-up will demonstrate quality of work, construction methods, relationship to other work.

#### 1.8 PRE-INSTALLATION CONFERENCE

- A. Installer of the Work of this Section is required to attend pre-installation conference specified under Section 04 20 00 - UNIT MASONRY.

#### 1.9 DELIVERY, STORAGE AND HANDLING

- A. Storage and Handling Requirements:
  1. Protect wood materials from damage due to moisture, direct sunlight, excessive temperatures, surface contamination, corrosion and damage from construction operations and other causes.
  2. Store materials in an elevated dry location, protected by waterproof coverings.

### PART 2 - PRODUCTS

#### 2.1 BOARD AND SHEET MATERIALS

- A. Sustainable Forest Certification: All wood shall be "Chain-of-Custody" certified as FSC Certified.
- B. Framing Lumber for studs, beams, joists, rafters, and headers: No. 2 Spruce/Pine/Fir (SPF), or No. 2 Southern Pine, Grade-stamped S-Dry or other surface dried wood species, Number 2 grade or better having a minimum bending stress Fb of 775 PSI (890 PSI repetitive) and modulus of elasticity E not less than 1100 KSI.
- C. Lumber for blocking, nailers and curbs as indicated or required: Hem-Fir, Douglas Fir, Eastern Spruce, Eastern Hemlock, or Southern Pine, surfaced dried stud or utility grade. Wood members shall be of sizes indicated on the Drawings or of the same size as the members being braced.
  1. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
  2. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.
- D. Furring: Nominal 1 by 3 inches or 1 by 4 inches Douglas Fir, Eastern Spruce, Eastern Hemlock, or Southern Pine, surfaced dried construction grade.
- E. Plywood and sheet products:

1. Stage flooring: ½ inch thick, medium density fiberboard (MDF) of thickness indicated on the Drawings, conforming to ANSI A208.2 product class MD, fabricated from 100 percent recycled fiber, using formaldehyde free synthetic resin such as methyl diisocyanate (MDI), having a minimum density of 45 pounds per cubic foot (769 kg/m<sup>3</sup>). Acceptable products include the following or approved equal:
  - a. Flakeboard, Toronto, Ontario, Canada, product: "Superior MDF".
  - b. SierrePine Inc., Moncure, NC, product "Medite II".
  - c. Plum Creek Timber Company Inc., Seattle, WA, product "Standard MDF".
2. Interior wall sheathing: APA RATED SHEATHING, 3/4 inch (19.1 mm) thick having a minimum span rating 48/24, 5 ply/5 layer plywood touch-sanded.
3. Roof sheathing: 5/8 inch (15.9 mm) thick having a minimum span rating 40/20, APA RATED SHEATHING, STRUCTURAL 1, exposure durability classified, EXPOSURE 1, plywood touch-sanded.
4. Marine grade plywood: EWA MARINE A-A EXT, fir veneer marine grade plywood, with plugged cores and sanded faces.
5. For substrate beneath gypsum board: Square edge APA graded C-D-X EXT, touch-sanded, 1/2 inch thick, except as otherwise indicated on the Drawings
6. For electric panel board mountings and similar uses: APA graded B-D INT, Group 2 species, touch-sanded, fire-retardant treated, 3/4 inch thick, except as otherwise indicated on the Drawings.
7. For unspecified interior concealed from view locations: APA graded C-D PLUGGED INT, Group 2 species, thickness as indicated on the Drawings.

## 2.2 RAILINGS

- A. Temporary handrails and guardrails: Plain carbon steel as detailed on the Drawings. Connections and sizing to conform to engineering and code requirements specified herein.
  1. Steel pipe: ASTM A53, grade A, seamless pipe, black finish unless otherwise noted.
  2. Structural steel tubing, square and rectangular shapes: ASTM A500, Grade B.
  3. Steel tubular shapes: ASTM A 501.

## 2.3 CONCRETE MIX

- A. Concrete materials:
  1. Cement conforming to ASTM C 150, Type II - Normal.
  2. Fly ash: ASTM C 618 with the following modifications to Table 1, Chemical Requirements:
    - a. Loss on ignition is limited to 3 percent, maximum.
    - b. Sulfur trioxide (SO<sub>3</sub>) is limited to 4.0 percent, maximum.
  3. Fine aggregates conforming to ASTM C 33; natural sand. Limit content of coal and lignite to 0.5 per cent by volume.
  4. Coarse aggregates conforming to ASTM C 33; Class 4S, crushed stone or gravel.

- 5. Water: Potable and complying with ASTM C 94.
- B. Mix concrete and deliver in accordance with ASTM C 94; ready mixed concrete.
  - 1. Ensure that concrete is completely discharged at the site within 1-1/2 hours after the introduction of the cement to the aggregates. In hot weather reduce this time limit so that no stiffening of the concrete shall occur until after it has been placed.
  - 2. Begin the mixing operation within 30 minutes after the cement has been intermingled with the aggregates.
- C. Select proportions for normal weight concrete in accordance with ASTM C94, meeting the following Criteria:
  - 1. Minimum compressive strength: 28 day strength: 4,000 psi.
  - 2. Aggregate size: 3/4 inches maximum.
  - 3. Water/cement or water/cement plus fly ash ratio: 0.45 maximum.
  - 4. Air Entrainment, plus 2 per cent, minus 1 per cent:
    - a. 5 percent of volume minimum for exterior work.
    - b. 3 percent of volume maximum for interior work.
- D. Round footings: Seamless Sonotube "Fibre Form" manufactured by Sonoco Products Co. or equal.

#### 2.4 ROOFING MATERIALS

- A. Asphalt shingles: UL Class 'A' and wind resistant label Self-sealing, laminated, mineral granule surfaced, glass fiber mat base shingle roofing, in color as selected by Architect, conforming to ASTM specifications: D 3018 Type I and D 3462, having a minimum weight of 230 pounds per roofing square with a minimum initial SRI of 0.47 and furnished with a limited lifetime manufacturers product warranty. Acceptable products include the following:
  - 1. Manufacturer: To establish a standard of quality, design and function desired, Drawings and specifications have been based on Certainteed Corporation, product "Landmark Solaris Platinum".
  - 2. Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
    - a. Certainteed Corporation (Saint-Gobain), Valley Forge, PA.
    - b. GAF-Elk Corporation, Wayne NJ.
    - c. IKO North America, Kankakee IL.
    - d. Owens-Corning Fiberglas Corp, Toledo OH.
- B. Ridge tiles: Furnish manufacturer's nominal 12 by 12 inch compatible hip and ridge shingles in color match roof shingles.
- C. Synthetic Underlayment: UV stabilized polypropylene, slip resistant, breathable, synthetic roof underlayment, mechanically attached (non-self-adhered), Class A rated and complying with ASTM D 226 and D 4869.
  - 1. Acceptable products include the following :

- a. Atlas Roofing Corp., Atlanta, GA., product "Summit Synthetic Underlayment"
- b. Certainteed Corporation (Saint-Gobain), Valley Forge, PA., product "Diamond Deck".
- c. Epilay, Carson, CA., product "Protectite Platnum."
- d. GAF-Elk Corporation, Wayne NJ, product "Deck Armor".
- e. InterWRap, Inc., Vancouver BC, Canada, product "Titanium UDL50"
- f. Owens-Corning Fiberglas Corp, Toledo OH., product "Deck Defense."
- g. W.R. Grace Company, Cambridge MA, product "Grace Tri-Flex."

## 2.5 WOOD TREATMENTS

- A. Treated wood products shall be produced by a single treatment plant, fully licensed by the chemical manufacturers, and conforming to the requirements specified herein.
  1. Toxicity and Environmental Quality:
    - a. Products containing chromium will not be permitted.
    - b. Products containing arsenic will not be permitted.
    - c. Fire-retardant-treated wood products shall be free of halogens, sulfates, ammonium phosphate and formaldehyde.
  2. Dye wood or otherwise color code all treated wood at treatment plant to clearly distinguish the different treatments in the field.
  3. Kiln dry all treated lumber and plywood to the following maximum moisture content after treatment.
    - a. Lumber: 19 percent.
    - b. Plywood 15 percent.
    - c. Discard pieces with defects which might impair quality of work.
  4. Quality marks: Each piece of lumber and plywood shall be permanently affixed with a quality mark, containing the following information:
    - a. Identification of the inspection agency.
    - b. Standard to which material was treated.
    - c. Identification of the treating plant.
    - d. Fire retardant treated wood shall include: stamp signifying a FR-S rating
    - e. Preservative treated wood shall include: Retention and end use for which product is suitable.
- B. Interior fire retardant treated wood.
  1. Chemical Manufacturer: Subject to compliance with the requirements specified herein, Products which may be incorporated in the work include the following or approved equal:
    - a. Hickson Corporation, product, "Dricon".
    - b. Koppers Performance Chemical, Inc., Griffin GA., product "FirePro".
    - c. Hoover Treated Wood Products, Inc., product "PyroGuard".
    - d. Viance, LLC., Charlotte, NC, product: "D-Blaze FRT".

2. Fire retardant treated wood shall comply with the following requirements:
  - a. All fire-retardant lumber and plywood must have an Underwriters Laboratories stamp signifying a FR-S rating certifying a 25 or less flame spread and smoke developed value, when tested in accordance to ASTM E-84, or UBC Standard No. 42-1.
  - b. Corrosion rates: Less than one mil per year for carbon steel, galvanized steel, aluminum, copper and red brass in contact with the fire retardant treated wood when tested in accordance with Federal Specification MIL-L-19140E Paragraph 4.6.5.2.
  - c. The fire retardant treated wood must have an equilibrium moisture content of not more than 25 percent when tested in accordance with ASTM D 3201 procedures at 95 percent relative humidity and 80 degrees Fahrenheit.
  - d. Fire retardant chemical: Registered for use as a wood preservative by the U.S. Environmental Protection Agency.
  - e. Testing: Fire performance and strength properties for both lumber and plywood, of the fire retardant treated wood shall be recognized by issuance of a ICC Evaluation Service Report. Fire retardant chemical must not damage the middle lammella of the wood structure when exposed to 170 degrees Fahrenheit and 90 percent relative humidity for 23 days.

C. Exterior fire retardant treated wood.

1. Chemical Manufacturer: Subject to compliance with the requirements specified herein, Products which may be incorporated in the work include the following or approved equal:
  - a. Hickson Corporation, product, "FRX".
  - b. Hoover Treated Wood Products, Inc., product "Exterior Fire-X".
  - c. Chicago Flameproof, Montgomery, IL, product "Exterior FRT".
2. Fire retardant treated wood shall comply with the following requirements:
  - a. All fire-retardant lumber and plywood must have an Underwriters Laboratories stamp signifying a FR-S rating certifying a 25 or less flame spread and smoke developed value, when tested in accordance to ASTM E-84.
  - b. Corrosion rates: Less than one mil per year for carbon steel, galvanized steel, aluminum, copper and red brass in contact with the fire retardant treated wood when tested in accordance with Federal Specification MIL-L-19140E Paragraph 4.6.5.2.
  - c. The fire retardant treated wood must have an equilibrium moisture content of not more than 19 percent when tested in accordance with ASTM D 3201 procedures at 95 percent relative humidity and 80 degrees Fahrenheit.
  - d. Fire retardant chemical: Registered for use as a wood preservative by the U.S. Environmental Protection Agency.
  - e. Testing: Fire performance and strength properties for both lumber and plywood, of the fire retardant treated wood shall be recognized by issuance of a ICC Evaluation Service Report. Fire retardant chemical must not damage the middle lammella of the wood structure when

exposed to 170 degrees Fahrenheit and 90 percent relative humidity for 23 days.

- D. Pressure preservative treated wood. Designated as "PT"
  - 1. Chemical Manufacturer: Subject to compliance with the requirements specified herein, Products which may be incorporated in the work include the following or approved equal:
    - a. Osmose, Inc., Griffin GA., product "NatureWood".
    - b. Universal Forest Products, Inc., Grand Rapids MI., product "ProWood ACQ".
    - c. Viance, LLC., Charlotte, NC., product "Preserve"
  - 2. Treatment: Ammoniacal Copper Quaternary Compound (ACQ), arsenic-free and chromium-free chemical "ACQ Preservative" in accordance with AWPA Standards. Apply the preservative in a closed cylinder by pressure process in accordance with AWPA Standard C15.
    - a. Minimum preservative retention for floor plates, framing, lumber and plywood above ground use: 0.25 pounds per cubic foot (4.0 kg/m<sup>3</sup>) of ACQ chemical, in accordance with AWPA UC1, UC2, UC3A, and UC3B, or NER-643 as appropriate.
    - b. Minimum preservative retention for framing, lumber and plywood in contact with water, ground, concrete and masonry: 0.40 pounds per cubic foot (6.4 kg/m<sup>3</sup>) of ACQ chemical, in accordance with AWPA UC4A, UC4B, UC4C, or NER-643 as appropriate.
    - c. Minimum preservative retention for lumber and plywood in permanent wood foundations: 0.60 pounds per cubic foot (9.6 kg/m<sup>3</sup>) of ACQ chemical, in accordance with AWPA UC4B, or NER-643.
  - 3. Fixation of Chemical: Treated wood shall not be shipped from treatment plant until fixation of the preservative has occurred in the wood.

## 2.6 ACCESSORIES

- A. Adhesives:
  - 1. General: Provide adhesives which are low-VOC or non-VOC, non-flammable, water-proof after cured, odor free.
  - 2. Adhesive for lamination and fabrication of wood and plywood items: Exterior adhesives containing no urea formaldehydes, having a VOC limit of 70 g/L.
- B. Fasteners:
  - 1. General: Any materials or building systems on exterior side of air/vapor barrier shall be considered exterior and should be attached with stainless steel or corrosive resistant fasteners. Fasteners sized over ½ inch diameter can be hot-dip galvanized.
  - 2. Nails (interior and exterior): Galvanized common nails, of size and type to suit application and as required by state and local building codes.
  - 3. Screws:
    - a. Screws for interior applications: Flat head electroplated-galvanized wood screws of the appropriate sizes.
    - b. Screws for exterior applications:



- 1) For pressure preservative treated wood: Flat head stainless steel, wood screws, of the appropriate sizes. Aluminum and coated metals are prohibited.
  - 2) For general application (non-pressure preservative treated wood): Flat head hard aluminum, or stainless steel, wood screws, of the appropriate sizes.
- C. Anchor bolts, expansion bolts and lag screws: Hot-dipped galvanized steel, of the following types:
1. For lumber having actual thickness of 1-1/2 inches or greater to masonry and concrete: Anchor bolts or expansion bolts, as most applicable for the specific receiving surface material, 3/8-inch minimum diameter, spaced as shown on drawings, and staggered as far as practicable. Countersink all bolt heads, and provide head washers of matching material.
  2. For lumber having actual thickness of greater than 7/8-inch but less than 1-1/2 inches to masonry and concrete: Anchor bolts or expansion bolts, as most applicable for the specific receiving surface material, at least 1/4-inch diameter of the most appropriate lengths for the specific application, spaced as shown, and staggered as far as practicable. Countersink all bolt heads, and provide head washers of matching material.
  3. For lumber having actual thickness of 7/8-inch and less: Anchor bolts or expansion bolts, at least 1/4-inch in diameter; or screws, of the most appropriate sizes; in lengths most suitable for the specific application, countersunk, spaced, and staggered.
- D. Protection paper: Canadian red-rosen paper or kraft paper.
- E. Building paper: ASTM D 226, Non-perforated, No. 15 (73 kg/sq m) asphalt-saturated building felt.
- F. Flexible membrane AVB connection: Flexible fully adhering composite flexible flashing, .8 mm (30 mils min) of self-adhering butyl adhesive integrally bonded to a heavy foil facer. Membrane shall be interleaved with poly release paper until installed. Provide with manufacturer recommended surface conditioners, termination mastics and pre-formed corners.
1. Product:
    - a. Carlisle Waterproofing, product: "Aluma-GRIP 701."
    - b. Berry Plastics Corporation, product: "Polyken 626-35 Foilastic."
    - c. Tremco Commercial Sealants and Waterproofing, product: "ExoAir Foil Flashing."
- G. Backer rod: Compressible closed cell polyethylene, extruded polyolefin or polyurethane foam rod complying with ASTM C 1330, Type C, 1/3 greater in diameter than width of joint. Shape and size of compressible back-up shall be as recommended by manufacturer for the specific condition used. Provide one of the following, or equal.
1. Nomaco, Inc., Zebulon, NC, product : "Green Rod."
  2. Industrial Thermo Polymers, Ltd., Brampton, Ontario CN, product: "ITP Standard Backer Rod."

3. BASF Sonneborn Building Products Inc., Minneapolis, MN, product: "Sonolastic Closed Cell Baker Rod."
4. W.R. Meadows, Inc., Hampshire, IL, product: "Sealtight Kool-Rod."

## 2.7 FABRICATION - STAIRS AND RAILINGS

- A. Refer to the Drawings for location and details of temporary stairs and railings (handrails and guardrails) to be furnished and installed hereunder.
  1. Verify heights shown in Drawings comply with referenced codes and regulations.
- B. Stair and railing performance requirements; conform to all requirements of those codes and regulations referenced under Section 01 41 00 - REGULATORY REQUIREMENTS.
  1. Stairs: Design, fabricate and install stairs to safely support a minimum live load of 100 pounds per square foot and a concentrated load of 300 pounds on any area of four square inches as required under the 2015 International Building Code with Massachusetts Building Code, Ninth Edition amendments.
  2. Railings: Design, fabricate and install all railings in a manner which will ensure the railings will be capable of withstanding loads as follows and as required under the 2015 International Building Code with Massachusetts Building Code, Ninth Edition amendments.
    - a. Resist a load of 50 pounds per linear foot (0.73 kN/m) applied in any direction at the top and to transfer load through railing supports to structure.
    - b. Resist a single concentrated load of 200 pounds (0.89kN) applied in any direction at any point along the top, and to transfer load through railing supports to structure. Concentrated loading requirements are not concurrent with other loading requirements.
    - c. Intermediate rails, balusters and panel fillers shall resist a horizontally applied load of 50 pounds (0.89 kN) on an area equal to 1 square foot (0.093m<sup>2</sup>), including openings and space between rails. Reactions due to this loading are not required to be superimposed with loadings specified for top rail.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. All materials shall be inspected before use, with all checked, split and otherwise deficient stock rejected, or used only for miscellaneous blocking, furring or other incidental use. The Contractor shall be responsible for replacing all lumber which, due to warpage, twist, splitting, or checking, results in unsatisfactory work. Such replacement shall be required at any time, whether before or after application of finish material under other Sections.
- B. Verify exact locations of toilet accessories, door stops and similar items with Architect prior to installation of blocking for accessories.

### 3.2 INSTALLATION - GENERAL

- A. Closely coordinate the installation of the rough carpentry work with the work of other trades responsible for the installation of interfacing or overlaying materials, so as not to delay the work of the related trades.
- B. Erect all rough carpentry work plumb, level, and true with tight, close fitting joints, securely attached and braced to surrounding construction, all in a first class workmanlike manner. Counterbore for bolt heads, nuts, and washers where required to avoid interference with other materials. Bear complete responsibility for structural integrity, connections, and anchorage of all rough carpentry work.
- C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- D. Use as long lengths as practicable for wood nailers, blockings, and curbs, to minimize number of joints, and attach the members with the types, and spacing, of fasteners specified herein.
- E. Install blocking, grounds and furring, as required for proper attachment of the work of other trades, in accordance with the requirements provided by the respective related trades.
  - 1. Spacing for furring and strapping shall not exceed 16 inches on center.
- F. Field cuts of fire retardant treated lumber: Do not rip or mill fire retardant treated lumber. Only end cuts, drilling holes and joining cuts are permitted.
- G. Field cuts of ACQ pressure-treated lumber: Apply solution of copper naphthenate containing a minimum of 2 percent metallic copper in-solution, in accordance with AWWA standard M4. Brush liberally all cuts and holes.
- H. Install concealed from view plywood with specified fasteners spaced not more than 10 inches on centers.
- I. Install fire-treated plywood backer boards with counter-sunk galvanized fasteners, of specified sizes, spaced not more than 12 inches on centers.

### 3.3 INSTALLATION - ROOF NAILERS AND BLOCKING

- A. General: Provide anchorage for nailers as required for roof and edging, coordinate requirements with Section 07 54 19 – POLYVINYL CHLORIDE (PVC) ROOFING.
  - 1. Bolt blocking to steel angles.
- B. When building up layers of nailers and blocking, fully secure each layer to at least the one below, alternating location of fasteners, spacing at 12 inches on center. Provide fasteners in lengths to penetrate through more than one substrate layer of blocking. Stagger locations of butt ends of boards, such that no two joints are "lined up".
- C. Ensure finished height of nailers is same as top surface of roof insulation within 1/4-inch, plus or minus.

### 3.4 INSTALLATION – EQUIPMENT BACKBOARDS

- A. Provide panel mounting backboards for HVAC, Fire Prevention, Electrical and telephone/data equipment. Fabricate panels using fire-retardant treated 3/4 inch thick panels mounted to fire-retardant treated 2 by 4's. Provide a nominal space of 3-1/2 inches behind panels to permit wiring.

### 3.5 INSTALLATION - METAL DOOR FRAMES

- A. Place in position all steel frames, furnished under Section 08 11 13 - HOLLOW METAL DOORS AND FRAMES, in accordance with the approved shop drawings and frame schedule.
  - 1. During the installation of metal door frames, after the manufacturer's steel spreader bar has been removed, install wood spreaders at door opening, carefully dimensioned to permit square, true installation of door frames and doors.
  - 2. Spreaders and bracing shall remain in place until doors are installed.
- B. Coordinate installation of frames with the various trades installing abutting wall construction for anchor placement.
  - 1. Place, erect and level all frames into correct scheduled locations, including those in masonry partitions.
  - 2. Provide temporary spreaders and bracing for door frames to be installed into masonry partitions. Maintain frame position with temporary bracing until frames are built-into-place under Division 4 - MASONRY.
- C. Coordinate installation of frames with installation of hardware under Section 06 20 00 - FINISH CARPENTRY and as furnished under Section 08 71 00 - DOOR HARDWARE.
- D. Install frames in accordance with the manufacturer's recommendations, ANSI/SDI-100, SDI-105, and the Door Hardware Institute (DHI) recommendations.
  - 1. Provide rigid temporary bracing for frames as required to ensure maintenance of positioning, and remove only after frames have been permanently anchored.
  - 2. Where exposed fastener heads occur in frames, fill with automotive body filler and sand smooth.

### 3.6 TOLERANCES

- A. Door frames: Maximum diagonal distortion 1/16 inch measured with straight edge, corner to corner.

### 3.7 CLEANING

- A. Comply with requirements of Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL for handling and disposition of all construction and demolition waste.
- B. Daily clean work areas by sweeping and disposing of scraps and sawdust.

- C. Upon completion of the work of this Section in any given area, remove tools, equipment and all rubbish and debris from the work area; leave area in broom-clean condition.

### 3.8 SCHEDULES

- A. Wood treatment schedule:
1. Pressure preservative treat all concealed or exposed-to-view:
    - a. Lumber and plywood which comes in contact with concrete, masonry, or earth.
    - b. Lumber and plywood nailers, blocking and curbing directly related to roofing, flashing, and roof accessories.
    - c. Lumber and plywood rough-bucks, blocking and nailers directly related to windows and storefront systems.
  2. Fire retardant treat all equipment backer boards, additionally provide fire retardant treated lumber and plywood where indicated or noted on Drawings.
- B. Wood blocking schedule: The following schedule lists common items for which blocking is required and may not be indicated on the Drawings. It is not the intention of this schedule to list all conditions requiring blocking or limit the extent of blocking required for completion of the Work; provide all wood blocking, edgings, nailers, required for receipt of various finishes and surfacing materials. Securely anchor wood blocking and run continuous between framing.
1. Blocking sizes indicated below are minimum sizes for conditions which not otherwise sized or keynoted on Drawings. In case of conflict, sizes identified on Drawings govern.

| Items  | Nominal size of blocking<br>with fastener notes |
|--|---|
| Cubicle curtain;   | 2 by 6 inch                                     |
| Door frames, having openings<br>exceeding 4 feet in width; | 2 by 4 inch, full height of wall framing        |
| Door frames, cross corridors;                              | 2 by 4 inch                                     |
| Door stops, wall mounted;                                  | 1 by 3 inch                                     |
| Platform curtain and valence:                              | 2 by 4 inch                                     |
| Prefabricated display cases:                               | 2 by 4 inch                                     |
| Toilet compartments:                                       | 2 by 4 inch                                     |
| Folding panel partitions:                                  | 2 by 4 inch                                     |
| Locker bases:  | 2 by 4 inch                                     |
| Appliances:  | 2 by 4 inch                                     |
| Projector screens:   | 2 by 4 inch                                     |
| Laboratory equipment (goggle<br>cabinets, etc.):           | 2 by 4 inch                                     |
| Stage curtains:  | 2 by 4 inch                                     |
| Casework:  | 2 by 4 inch                                     |
| Grab bars;   | 2 by 6 inch, with 1/4 inch dia. toggle<br>bolts |
| Lavatories;  | 3/4 inch plywood extending full height          |

|  |   |
|--|---|
|  | from floor to top of wall framing. Install lavatories with 1/4 inch dia. toggle bolts |
| Mirrors, framed;   | 2 by 4 inch   |
| Soap dispensers, wall mounted;   | 1 by 3 inch   |
| Paper towel dispensers, waste receptacles, feminine napkin dispensers; | 1 by 3 inch   |
| Toilet paper dispensers;   | 2 by 4 inch   |
| Wall mounted railings;   | 2 by 8 inch   |
| Roof access ladders;   | 2 by 8 inch   |
| Window treatment:  | 2 by 4 inch   |
|  | 2 by 6 inch   |

End of Section

SECTION 09 91 12

COMMISSIONING OF BUILDING ASSEMBLIES

**PART 1 – GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

- A. This section includes commissioning process requirements for building enclosure systems and assemblies and equipment.
- B. Related Sections:
  - 1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.03 DESCRIPTION

- A. Refer to Division 01 Section "General Commissioning Requirements" for the description of commissioning.

1.04 DEFINITIONS

- A. Refer to Division 01 Section "General Commissioning Requirements" for definitions.

1.05 SUBMITTALS

- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's role.
- B. Refer to Division 01 Section "Submittal Procedures" for specific requirements. In addition, provide the following as required:
- C. Certificates of readiness
- D. Certificates of completion of installation, prestart, and startup activities
- E. O&M manuals
- F. Test Reports.

1.06 QUALITY ASSURANCE

- A. Test Equipment Calibration Requirements: Contractors will comply with test manufacturer' calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.07 COORDINATION

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to coordination during the commissioning process.

## PART 2 – PRODUCTS

### 2.01 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Contractor for the equipment / system being tested. For example, the contractors of Division 4, 7 and 8 shall ultimately be responsible for all standard testing equipment for the Building Assembly systems in Divisions 4, 7 and 8.
- B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the base bid price to the Owner and left on site.
- C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.
- D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

## PART 3 – EXECUTION

### 3.01 GENERAL DOCUMENTATION

- A. **Red-lined Drawing:** The building assembly contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawing. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings. The contracted party, as defined in the Contract Documents will create the as-built drawings.
- B. **Operation and Maintenance Data:** Building Assembly contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems. The CxA will review the O&M literature once for conformance to project requirements. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.
- C. **Demonstration and Training:** Building Assembly contractor will provide demonstration and training as required by the specifications. A complete training plan and schedule must be submitted by the contractor to the CxA four weeks (4) prior to any training. A training agenda for each training session must be submitted to the CxA one (1) week prior to the training session.

### 3.02 CONTRACTOR'S RESPONSIBILITIES

- A. Perform tests as required in Divisions 04, 07 and 08. In addition the following test shall be performed by the applicable installing building assembly contractor.
  - 1. In addition to the services outlined in the project specifications acceptance testing of newly installed window and door systems shall include water penetration testing in accordance with ASTM E1105 and acceptance testing of new roofing systems shall include field uplift testing in accordance with ASTM E907 as applicable. These tests are included in this commissioning specification and are to be performed under the construction contract and witnessed and evaluated by the commissioning consultant.
- B. Participate in building assembly systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
- C. Provide information requested by the CxA for final commissioning documentation.



- D. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.
- E. Prepare preliminary schedule for building assembly system orientations and inspections, operation and maintenance manual submissions, training sessions, equipment start-up task completion for owner. Distribute preliminary schedule to commissioning team members.
- F. Update schedule as required throughout the construction period.
- G. Assist the CxA in all verification and functional performance tests.
- H. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
- I. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA 45 days after submittal acceptance.
- J. Coordinate with the CxA to provide 48-hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
- K. Participate in, and schedule vendors and contractors to participate in the training sessions.
- L. Provide written notification to the CM/GC and CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.
- M. The equipment supplier shall document the performance of his equipment.
- N. Provide a complete set of red-lined drawings to the project team.
- O. Equipment Suppliers
  - 1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.
  - 2. Assist in equipment testing per agreements with contractors.
  - 3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
- A. Refer to Division 01 Section "General Commissioning Requirements" for additional Contractor responsibilities.

### 3.03 CxA'S RESPONSIBILITIES

- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's Responsibilities.

### 3.04 TESTING PREPARATION

- A. Certify in writing to the project team that Building Assembly systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
- B. Certify in writing to the project team that any Building Assembly instrumentation and controls have been completed and calibrated, that they are operating according to the Contract Documents.
- C. Certify in writing that testing procedures have been completed and that testing reports have been submitted, discrepancies corrected, and corrective work approved.
- D. Place systems, subsystems, and equipment into operating mode to be tested if applicable (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
- E. Inspect and verify the position of each device and interlock identified.
- F. Testing Instrumentation: Install measuring instruments and logging devices to record test data as required by specifications.

3.05 GENERAL TESTING REQUIREMENTS

- G. Provide technicians, instrumentation, and tools to perform required testing.
- H. Tests will be performed using design conditions whenever possible.
- I. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- J. If tests cannot be completed because of a deficiency outside the scope of the Building Assembly system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.
- K. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.06 BUILDING ASSEMBLY SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

- A. **Equipment Testing and Acceptance Procedures:** Testing requirements are specified in individual Division 4, 7 and 8 sections. Provide submittals, test data, inspector record and certifications to the project team.
- B. **Building Assembly System Testing:** Field testing plans and testing requirements are specified in Divisions 4, 7 and 8.
- C. **Building Assembly System Testing:** Provide technicians, instrumentation, tools and equipment to test performance of designated systems and devices.
- D. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The following equipment and systems shall be evaluated:
  - 1. Building Envelope
    - a. Exterior Walls, Windows & Doors
    - b. Louvers and vents
    - c. Grilles and sunscreens
    - d. Infrared scan of envelope (performed by CxA)
  - 2. Roofing
    - a. Roofing systems, including parapet
    - b. Roofing openings, including skylights, pipe chases, ducts, etc.
    - c. Infrared scan of roof (performed by CxA)

3.07 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

- A. Refer to Division 01 Section "Commissioning Requirements" for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

3.08 APPROVAL

- A. Refer to Division 01 Section "Commissioning Requirements" for approval procedures.

3.09 DEFERRED TESTING

- A. Refer to Division 01 Section "Commissioning Requirements" for requirements pertaining to deferred testing.

3.10 OPERATION AND MAINTENANCE MANUALS

- A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements as stated in Division 01.
- B. Refer to Division 01 Section "Commissioning Requirements" for the AE and CxA roles in the Operation and Maintenance Manual contribution, review and approval process.

3.11 TRAINING OF OWNER PERSONNEL

- A. Refer to Division 01 Section "Commissioning Requirements" and individual specification sections for requirements pertaining to training.

**END OF SECTION**

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Section 10 14 53  
TRAFFIC SIGNAGE

**PART 1 - GENERAL**

**1.1 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

**1.2 DESCRIPTION OF WORK**

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:
  - 1. Manufacture of Signs
  - 2. Installation of Signs and Sign Posts
- B. Alternates: Not Applicable.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
  - 1. Section 32 12 16 – ASPHALT PAVING for placement of curbing (sloped granite, vertical granite, and Cape Cod berm) and paving of roadways and parking lots.
  - 2. Section 32 13 13 – CONCRETE PAVING for installation of cement concrete paving for driveways and sidewalks.
  - 3. Section 32 92 00 – LAWNS for installation of grassed lawns.
  - 4. Section 03 30 00 – CAST-IN-PLACE CONCRETE for Portland cement concrete requirements.

**1.3 SUBMITTALS**

- A. Refer to SECTION 01 33 00 – SUBMITTALS for submittal provisions and procedures.
  - 1. The shop drawing submittals for the signs and posts shall clearly show materials, layouts, sizes, finishes, supports, foundations, connections, and relationship to driveway/curb line.

**1.4 REFERENCE STANDARDS**

- A. The following standards are applicable to the work of this Section to the extent referenced herein:
  - 1. Commonwealth of Massachusetts, Massachusetts Highway Department (MHD), Standard Specifications for Highways and Bridges, latest English Edition with amendments, hereinafter referred to as the "Standard Specifications." All references to method of measurement, basis of payment and payment items in the Standard Specifications are hereby deleted. References made to particular sections or

paragraphs in the Standard Specifications shall include all related articles mentioned therein.

2. Commonwealth of Massachusetts, Massachusetts Highway Department, Construction Standards, latest Edition with amendments, hereinafter referred to as the "Construction Standards."
3. MUTCD: Manual on Uniform Traffic Control Devices.
4. All control equipment shall conform to appropriate ITE and National Electrical Manufacturers Association (NEMA) Specifications.
5. Commonwealth of Massachusetts Architectural Access Board CMR 521.

#### 1.5 EXAMINATION OF SITE AND DOCUMENTS

- A. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of a lack of knowledge of existing conditions as indicated in the Construction Documents, or obvious from observation of the site.
- B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period and formed his own conclusions as to the full requirements of the work involved.

### PART 2-PRODUCTS

#### 2.1 SIGN MATERIALS

- A. Material for all sign panels shall be aluminum panels Type A-1 with high-intensity prismatic sheeting Type III or better in accordance with the relevant provisions of Section 828 Traffic Signs of the "Standard Specifications." Reflective sheeting shall meet the requirements of ASTM D4956 and AASHTO M268.

#### 2.2 SIGN POSTS

- A. Sign supports and foundations shall be in accordance with the details indicated on the Contract Drawings and Section 840.60 of the "Standard Specifications." Signs shall be mounted on one 2¼-inch square, 14-gauge galvanized steel breakaway post. Each post shall have 7/16-inch-diameter die punched knockout/holes on all four sides for the entire length of the post. Knockout/holes shall be on the centerline of each side, 1-inch on center, in true alignment and opposite each other.

### PART 3-EXECUTION

#### 3.1 SIGN INSTALLATION

- A. Sign fabrication and erection shall be in accordance with the relevant requirements of Sections 828 and 840 of the "Standard Specifications" and the "Construction Standards."
  1. Post foundations, except in ledge, shall be excavated by an auger to the next lines of the outside diameter of the footing without disturbing the soil around or below the excavation.
  2. Concrete foundations shall be poured monolithically to grade.
- B. The Contractor shall mark the location of all on-site signs and shall obtain the approval of the Owner's Representative before any signs are installed.

- C. Signs located in areas subject to pedestrian traffic shall be mounted with 7-foot clearance to the bottom of the sign.
- D. Signs shall be mounted at right angles to the direction of, and facing, the traffic they are intended to serve. The sign panel shall be located a minimum of one foot from the curbline or edge of pavement.
- E. Solar Powered Flashing School Warning Sign shall be installed per manufacturers recommendation and conform to MUTCD standards.

End of Section

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SECTION 21 08 00

COMMISSIONING OF FIRE SUPPRESSION

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

- A. This section includes commissioning process requirements for Fire Suppression systems, assemblies, and equipment.
- B. Related Sections:
  - 1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.03 DESCRIPTION

- A. Refer to Division 01 Section "General Commissioning Requirements" for the description of commissioning.

1.04 DEFINITIONS

- A. Refer to Division 01 Section "General Commissioning Requirements" for definitions.

1.05 SUBMITTALS

- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's role.
- B. Refer to Division 01 Section "Submittals" for specific requirements. In addition, provide the following:
- C. Certificates of readiness
- D. Certificates of completion of installation, prestart, and startup activities.
- E. O&M manuals
- F. Test reports

1.06 QUALITY ASSURANCE

- A. Test Equipment Calibration Requirements: Contractors will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.07 COORDINATION

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to coordination during the commissioning process.

**PART 2 - PRODUCTS**

2.01 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the contractor for the equipment being tested. For example, the fire protection contractor of Division 21 shall ultimately be responsible for all standard testing equipment for the plumbing system in Division 21.

- B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the base bid price to the Owner and left on site, except for stand-alone data logging equipment that may be used by the CxA.
- C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.
- D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

### PART 3 - EXECUTION

#### 3.01 GENERAL DOCUMENTATION REQUIREMENTS

- A. With assistance from the installing fire suppression contractors, the CxA will prepare Pre-Functional Checklists for applicable commissioned components, equipment, and systems.
- B. Red-lined Drawings: The fire suppression contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings. The contracted party, as defined in the Contract Documents will create the as-built drawings.
- C. Operation and Maintenance Data: Fire Suppression Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems. The CxA will review the O&M literature once for conformance to project requirements. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the contractor.
- D. Demonstration and Training: Fire Suppression Contractor will provide demonstration and training as required by the specifications. A complete training plan and schedule must be submitted by the contractor to the CxA four weeks (4) prior to any training. A training agenda for each training session must be submitted to the CxA one (1) week prior the training session

#### 3.02 CONTRACTOR'S RESPONSIBILITIES

- A. Perform tests that are specified in the Division 21.
- B. Attend construction phase coordination meetings.
- C. Participate in Fire Suppression systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
- D. Provide information requested by the CxA for final commissioning documentation.
- E. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.
- F. Prepare preliminary schedule for Fire Suppression system orientations and inspections, operation and maintenance manual submissions, training sessions, flushing and cleaning, equipment start-up, and task completion for owner. Distribute preliminary schedule to commissioning team members.
- G. Update schedule as required throughout the construction period.
- H. Assist the CxA in all verification and functional performance tests.

- I. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
  - J. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA 45 days after submittal acceptance.
  - K. Coordinate with the CxA to provide 48-hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
  - L. Participate in, and schedule vendors and contractors to participate in the training sessions.
  - M. Provide written notification to the CM/GC and CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.
    - 1. Life Safety/Fire Suppression equipment including pumps, piping, and all other equipment furnished under this Division.
    - 2. Automatic sprinkler and standpipe systems.
    - 3. Fire stopping in fire rated construction, including caulking, gasketing and sealing of smoke barriers.
  - N. The equipment supplier shall document the performance of his equipment.
  - O. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.
  - P. Equipment Suppliers
    - 1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.
    - 2. Assist in equipment testing per agreements with contractors.
    - 3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
  - Q. Refer to Division 01 Section "General Commissioning Requirements" for additional contractor responsibilities.
- 3.03 CxA'S RESPONSIBILITIES
- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's Responsibilities.
- 3.04 TESTING PREPARATION
- A. Certify in writing to the CxA that Life Safety/Fire Suppression systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
  - B. Certify in writing to the CxA that Life Safety/Fire Suppression instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
  - C. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
  - D. Inspect and verify the position of each device and interlock identified on checklists.
  - E. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
  - F. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.
- 3.05 GENERAL TESTING REQUIREMENTS
- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.
  - B. Scope of Life Safety/Fire Protection testing shall include entire Fire Suppression installation. Testing shall include measuring capacities and effectiveness of operational and control functions.
  - C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions.

- D. The CxA along with the Fire Suppression contractor shall prepare detailed testing plans, procedures, and checklists for Fire Suppression systems, subsystems, and equipment.
- E. Tests will be performed using design conditions whenever possible.
- F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- G. The CxA may direct that set points be altered when simulating conditions is not practical.
- H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
- I. If tests cannot be completed because of a deficiency outside the scope of the Fire Suppression system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.
- J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.06 FIRE SUPPRESSION SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

- A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 21 sections. Provide submittals, test data, inspector record, and certifications to the CxA.
- B. Fire Suppression Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of sprinkler distribution systems.
- C. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The following equipment and systems shall be evaluated:

|                                 |
|---------------------------------|
| <b>Fire Suppression Systems</b> |
|---------------------------------|

|                          |
|--------------------------|
| Fire suppression systems |
|--------------------------|

3.07 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

3.08 APPROVAL

- A. Refer to Division 01 Section "General Commissioning Requirements" for approval procedures.

3.09 DEFERRED TESTING

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deferred testing.

3.10 OPERATION AND MAINTENANCE MANUALS

- A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements as stated in Division 01.
- B. Refer to Division 01 Section "General Commissioning Requirements" for the AE and CxA roles in the Operation and Maintenance Manual contribution, review and approval process.

3.11 TRAINING OF OWNER PERSONNEL

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to training.

**END OF SECTION**

SECTION 22 08 00

COMMISSIONING OF PLUMBING SYSTEMS

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

- A. This section includes commissioning process requirements for Plumbing systems, assemblies, and equipment.
- B. Related Sections:
  - 1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.03 DESCRIPTION

- A. Refer to Division 01 Section "General Commissioning Requirements" for the description of commissioning.

1.04 DEFINITIONS

- A. Refer to Division 01 Section "General Commissioning Requirements" for definitions.

1.05 SUBMITTALS

- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's role.
- B. Refer to Division 01 Section "Submittals" for specific requirements. In addition, provide the following:
- C. Certificates of readiness
- D. Certificates of completion of installation, prestart, and startup activities.
- E. O&M manuals
- F. Test reports

1.06 QUALITY ASSURANCE

- A. Test Equipment Calibration Requirements: Plumbing Contractors will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.07 COORDINATION

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to coordination during the commissioning process.

## PART 2 - PRODUCTS

### 2.01 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the contractor for the equipment being tested. For example, the plumbing contractor of Division 22 shall ultimately be responsible for all standard testing equipment for the plumbing system in Division 22, except for equipment specific to and used by TAB in their commissioning responsibilities.
- B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the base bid price to the Owner and left on site, except for stand-alone data logging equipment that may be used by the CxA.
- C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.
- D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

## PART 3 - EXECUTION

### 3.01 GENERAL DOCUMENTATION REQUIREMENTS

- A. With assistance from the installing plumbing contractors, the CxA will prepare Pre-Functional Checklists for all commissioned components, equipment, and systems.
- B. Red-lined Drawings: The plumbing contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings. The contracted party, as defined in the Contract Documents will create the as-built drawings.
- C. Operation and Maintenance Data: Plumbing Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems. The CxA will review the O&M literature once for conformance to project requirements. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the contractor.
- D. Demonstration and Training: Plumbing Contractor will provide demonstration and training as required by the specifications. A complete training plan and schedule must be submitted by the contractor to the CxA four weeks (4) prior to any training. A training agenda for each training session must be submitted to the CxA one (1) week prior the training session.

### 3.02 PLUMBING CONTRACTOR'S RESPONSIBILITIES

- A. Perform tests as required by Division 22.
- B. Attend construction phase controls coordination meetings as required.
- C. Participate in Plumbing systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
- D. Provide information requested by the CxA for final commissioning documentation.
- E. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.

- F. Prepare preliminary schedule for Plumbing system orientations and inspections, operation and maintenance manual submissions, training sessions, pipe and duct system testing, flushing and cleaning, equipment start-up, testing and balancing and task completion for owner. Distribute preliminary schedule to commissioning team members.
  - G. Update schedule as required throughout the construction period.
  - H. Assist the CxA in all verification and functional performance tests.
  - I. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
  - J. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA 45 days after submittal acceptance.
  - K. Coordinate with the CxA to provide 48-hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
  - L. Notify the CxA a minimum of two weeks in advance of the time for start of the balancing work..
  - M. Participate in, and schedule vendors and plumbing contractors to participate in the training sessions.
  - N. Provide written notification to the CM/GC and CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.
    - 1. Plumbing equipment including domestic water heaters, controls, pumps, valves plumbing fixtures, and all other equipment furnished under this Division.
  - O. The equipment supplier shall document the performance of his equipment.
  - P. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.
  - Q. Balance Contractor
    - 1. At the completion of the balancing work, and the submittal of the final balancing report, notify the Plumbing contractor and the CM/GC.
  - R. Equipment Suppliers
    - 1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.
    - 2. Assist in equipment testing per agreements with plumbing contractors.
    - 3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
  - S. Refer to Division 01 Section "General Commissioning Requirements" for additional contractor responsibilities.
- 3.03 CxA'S RESPONSIBILITIES
- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's Responsibilities.
- 3.04 TESTING PREPARATION
- A. Certify in writing to the CxA that Plumbing systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
  - B. Certify in writing to the CxA that Plumbing instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
  - C. Certify in writing that balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.
  - D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
  - E. Inspect and verify the position of each device and interlock identified on checklists.

- F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

- G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

### 3.05 DOMESTIC WATER BALANCING

- A. Notify the CxA at least ten (10) days in advance of testing and balancing Work, and provide access for the CxA to witness balancing Work.

### 3.06 GENERAL TESTING REQUIREMENTS

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.
- B. Scope of Plumbing testing shall include entire Plumbing installation. Testing shall include measuring capacities and effectiveness of operational and control functions.
- C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- D. The CxA along with the Plumbing contractor, balancing subcontractor shall prepare detailed testing plans, procedures, and checklists for Plumbing systems, subsystems, and equipment.
- E. Tests will be performed using design conditions whenever possible.
- F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- G. The CxA may direct that set points be altered when simulating conditions is not practical.
- H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
- I. If tests cannot be completed because of a deficiency outside the scope of the Plumbing system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.
- J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

### 3.07 PLUMBING SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

- A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 22 sections. Provide submittals, test data, inspector record, and certifications to the CxA.
- B. Plumbing Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 22 Sections. Assist the CxA with preparation of testing plans.
- C. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment: Test requirements are specified in Division 22 piping Sections. Plumbing Contractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include the following:
  - 1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
  - 2. Description of equipment for flushing operations.
  - 3. Minimum flushing water velocity.
  - 4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.



- D. Plumbing Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of domestic water distribution systems.
- E. Vibration and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls as required.
- F. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The following equipment and systems shall be evaluated:

| <b>Plumbing Systems</b>                          |
|--|
| Natural gas systems                              |
| Compressed air systems                           |
| Backflow preventers                              |
| Water heaters                                    |
| Hot water storage                                |
| Recirculation pumps                              |
| Water closets and sinks                          |
| Laboratory waste and acid neutralization systems |
| Safety shower/eyewash stations                   |
| Mixing valves                                    |
| Rain water reclamation systems                   |

- 3.08 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT
  - A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.
- 3.09 APPROVAL
  - A. Refer to Division 01 Section "General Commissioning Requirements" for approval procedures.
- 3.10 DEFERRED TESTING
  - A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deferred testing.
- 3.11 OPERATION AND MAINTENANCE MANUALS
  - A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements as stated in Division 01.
  - B. Refer to Division 01 Section "General Commissioning Requirements" for the AE and CxA roles in the Operation and Maintenance Manual contribution, review and approval process.
- 3.12 TRAINING OF OWNER PERSONNEL
  - A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to training.

**END OF SECTION**

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SECTION 23 08 00

COMMISSIONING OF HVAC SYSTEMS

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.
- B. The OPR and BOD documentation are included by reference for information only.

1.02 SUMMARY

- A. This section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment.
- B. Related Sections:
  - 1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.03 DESCRIPTION

- A. Refer to Division 01 Section "General Commissioning Requirements" for the description of commissioning.

1.04 DEFINITIONS

- A. Refer to Division 01 Section "General Commissioning Requirements" for definitions.

1.05 SUBMITTALS

- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's role.
- B. Refer to Division 01 Section "Submittals" for specific requirements. In addition, provide the following:
- C. Certificates of readiness
- D. Certificates of completion of installation, prestart, and startup activities.
- E. O&M manuals
- F. Test reports

1.06 QUALITY ASSURANCE

- A. Test Equipment Calibration Requirements: HVAC Contractors will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.07 COORDINATION

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to coordination during the commissioning process.

## **PART 2 - PRODUCTS**

### **2.01 TEST EQUIPMENT**

- A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC&R system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities.
- B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the base bid price to the Owner and left on site, except for stand-alone data logging equipment that may be used by the CxA.
- C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.
- D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

## **PART 3 - EXECUTION**

### **3.01 GENERAL DOCUMENTATION REQUIREMENTS**

- A. With assistance from the installing contractors, the CxA will prepare Pre-Functional Checklists for all commissioned components, equipment, and systems
- B. Red-lined Drawings: The contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings. The contracted party, as defined in the Contract Documents will create the as-built drawings.
- C. Operation and Maintenance Data: Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems. The CxA will review the O&M literature once for conformance to project requirements. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the HVAC Contractor.
- D. Demonstration and Training: Contractor will provide demonstration and training as required by the specifications. A complete training plan and schedule must be submitted by the contractor to the CxA four weeks (4) prior to any training. A training agenda for each training session must be submitted to the CxA one (1) week prior the training session

### **3.02 HVAC CONTRACTOR'S RESPONSIBILITIES**

- A. Perform commissioning functional test procedures at the direction of the CxA. This includes but is not limited to the controls contractor verifying with the CxA that all sequences of operations are functioning properly.
- B. Attend construction phase controls coordination meetings.
- C. Attend testing, adjusting, and balancing review and coordination meetings.
- D. Participate in HVAC&R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
- E. Provide information requested by the CxA for final commissioning documentation. This may include but is not limited to pipe pressure tests, duct leakage tests and flushing / cleaning reports.

- F. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.
- G. Prepare preliminary schedule for Mechanical system orientations and inspections, operation and maintenance manual submissions, training sessions, pipe and duct system testing, flushing and cleaning, equipment start-up, testing and balancing and task completion for owner. Distribute preliminary schedule to commissioning team members.
- H. Update schedule as required throughout the construction period.
- I. Assist the CxA in all verification and functional performance tests. While the CxA is onsite the contractor does not need to be with the CxA throughout the entire day but only needs to be available if assistance is needed (such as turning a piece of equipment on). The exception is that the controls contractor is expected to verify all sequences of operation with the CxA.
- J. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
- K. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA 45 days after submittal acceptance.
- L. Coordinate with the CxA to provide 48-hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
- M. Notify the CxA a minimum of two weeks in advance of the time for start of the testing and balancing work. Attend the initial testing and balancing meeting for review of the official testing and balancing procedures.
- N. Participate in, and schedule vendors and contractors to participate in the training sessions.
- O. Provide written notification to the CM/GC and CxA Authority that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.
- P. The equipment supplier shall document the performance of his equipment.
- Q. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.
- R. Test, Adjust and Balance Contractor
  - 1. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
  - 2. Submit the site specific testing and balancing plan to the CxA and AE for review and acceptance.
  - 3. Attend the testing and balancing review meeting scheduled by the CxA. Be prepared to discuss the procedures that shall be followed in testing, adjusting, and balancing the HVAC&R system.
  - 4. At the completion of the testing and balancing work, and the submittal of the final testing and balancing report, notify the HVAC&R contractor and the CM/GC.
  - 5. At the completion of testing and balancing work, and the submittal of the final testing and balancing report, notify the HVAC&R Contractor and the CM/GC.
  - 6. Participate in verification of the testing and balancing report, which will consist of repeating measurements contained in the testing and balancing reports. Assist in diagnostic purposes when directed.
- S. Equipment Suppliers
  - 1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.
  - 2. Assist in equipment testing per agreements with contractors.
  - 3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
- T. Refer to Division 01 Section "General Commissioning Requirements" for additional contractor responsibilities.

3.03 CxA'S RESPONSIBILITIES

- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's Responsibilities.

3.04 TESTING PREPARATION

- A. Certify in writing to the CxA that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
- B. Certify in writing to the CxA that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
- C. Certify in writing that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.
- D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
- E. Inspect and verify the position of each device and interlock identified on checklists.
- F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
- G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.05 TESTING, ADJUSTING AND BALANCING VERIFICATION

- A. Prior to performance of Testing, Adjusting and Balancing work, provide copies of reports, sample forms, checklists, and certificates to the CxA.
- B. Notify the CxA at least ten (10) days in advance of testing and balancing Work, and provide access for the CxA to witness testing and balancing Work.
- C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the CxA.
  - 1. The CxA will notify testing and balancing subcontractor ten (10) days in advance of the date of field verification. Notice will not include data points to be verified.
  - 2. The testing and balancing subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.
  - 3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.
  - 4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.06 GENERAL TESTING REQUIREMENTS

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.
- B. Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.
- C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- D. The CxA along with the HVAC&R contractor, testing and balancing Subcontractor, and HVAC&R Instrumentation and Control Subcontractor shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.
- E. Tests will be performed using design conditions whenever possible.

- F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- G. The CxA may direct that set points be altered when simulating conditions is not practical.
- H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
- I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.
- J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.07 HVAC&R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

- A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 23 sections. Provide submittals, test data, inspector record, and certifications to the CxA.
- B. HVAC&R Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 23 Sections. Assist the CxA with preparation of testing plans.
- C. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment: Test requirements are specified in Division 23 piping Sections. HVAC&R Contractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include the following:
  - 1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
  - 2. Description of equipment for flushing operations.
  - 3. Minimum flushing water velocity.
  - 4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.
- D. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.
- E. HVAC&R Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems, including HVAC&R terminal equipment and unitary equipment.
- F. Vibration and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.
- G. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The following equipment and systems shall be evaluated:

|  |
|--|
| <b>HVAC Systems</b>  |
| Boilers  |
| Chillers   |
| Piping   |
| Heat Exchangers  |
| Pumps and drives   |
| Air handler systems  |
| Roof Top Units   |
| Heating and ventilating units  |
| Induction Units  |
| Displacement terminal units  |
| Unit Ventilators   |
| Cabinet unit heaters   |
| Fan coil units   |
| Unit heaters   |
| Radiant panels   |
| Finned tube radiation  |
| Convectors   |
| Chilled Beams  |
| Exhaust fans   |
| Combustion air units   |
| Split system AC  |
| Make-up air units  |
| Fume hoods   |
| Heat recovery systems  |
| Thermal Solar Systems  |
| Testing, adjusting and balancing spot check                                    |
| Automated temperature controls and energy management systems                   |
| <b>Building Automation and Controls</b>  |
| Interface of these systems with HVAC systems, fire alarm and security systems. |

- 3.08 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT
  - A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.
- 3.09 APPROVAL
  - A. Refer to Division 01 Section "General Commissioning Requirements" for approval procedures.
- 3.10 DEFERRED TESTING
  - A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deferred testing.
- 3.11 OPERATION AND MAINTENANCE MANUALS
  - A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements as stated in Division 01.



- B. Refer to Division 01 Section "General Commissioning Requirements" for the AE and CxA roles in the Operation and Maintenance Manual contribution, review and approval process.

3.12 TRAINING OF OWNER PERSONNEL

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to training.

**END OF SECTION**

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SECTION 26 08 00

COMMISSIONING OF ELECTRICAL SYSTEMS

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

- A. This section includes commissioning process requirements for Electrical systems, assemblies, and equipment.
- B. Related Sections:
  - 1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.03 DESCRIPTION

- A. Refer to Division 01 Section "General Commissioning Requirements" for the description of commissioning.

1.04 DEFINITIONS

- A. Refer to Division 01 Section "General Commissioning Requirements" for definitions.

1.05 SUBMITTALS

- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's role.
- B. Refer to Division 01 Section "Submittals" for specific requirements. In addition, provide the following:
- C. Certificates of readiness
- D. Certificates of completion of installation, pre-start, and startup activities.
- E. O&M manuals
- F. Test reports

1.06 QUALITY ASSURANCE

- A. Test Equipment Calibration Requirements: Electrical Subcontractors will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.07 COORDINATION

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to coordination during the commissioning process.

## **PART 2 - PRODUCTS**

### **2.01 TEST EQUIPMENT**

- A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Electrical Subcontractor for the equipment being tested. For example, the Electrical Subcontractor of Division 26 shall ultimately be responsible for all standard testing equipment for the electrical systems and controls systems in Division 26.
- B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the base bid price to the Owner and left on site, except for stand-alone data logging equipment that may be used by the CxA.
- C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.
- D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

## **PART 3 - EXECUTION**

### **3.01 GENERAL DOCUMENTATION REQUIREMENTS**

- A. With assistance from the installing Electrical Subcontractors, the CxA will prepare Pre-Functional Checklists for all commissioned components, equipment, and systems
- B. Red-lined Drawings: The Electrical Subcontractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings. The contracted party, as defined in the Contract Documents will create the as-built drawings.
- C. Operation and Maintenance Data: Electrical Subcontractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems. The CxA will review the O&M literature once for conformance to project requirements. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the Electrical Subcontractor.
- D. Demonstration and Training: Electrical Subcontractor will provide demonstration and training as required by the specifications. A complete training plan and schedule must be submitted by the Electrical Subcontractor to the CxA four weeks (4) prior to any training. A training agenda for each training session must be submitted to the CxA one (1) week prior the training session

### **3.02 ELECTRICAL SUBCONTRACTOR'S RESPONSIBILITIES**

- A. Perform tests as required by Division 26.
- B. Attend construction phase controls coordination meetings.
- C. Participate in Electrical systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CA.
- D. Provide information requested by the CxA for final commissioning documentation.
- E. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.

- F. Prepare preliminary schedule for Electrical system orientations and inspections, operation and maintenance manual submissions, training sessions, equipment start-up and task completion for owner. Distribute preliminary schedule to commissioning team members.
  - G. Update schedule as required throughout the construction period.
  - H. Assist the CxA in all verification and functional performance tests.
  - I. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the test period.
  - J. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA 45 days after submittal acceptance.
  - K. Coordinate with the CxA to provide 48-hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
  - L. Notify the CxA a minimum of two weeks in advance of the time for start of the testing and balancing work. Attend the initial testing and balancing meeting for review of the official testing and balancing procedures.
  - M. Participate in, and schedule vendors and Electrical Subcontractors to participate in the training sessions.
  - N. Provide written notification to the CM/GC and CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.
    - 1. Electrical equipment including but not limited to switchgear, panel boards, lighting, receptacles, lighting control and all other equipment furnished under this Division.
    - 2. Emergency generators, ATS switches and emergency power systems.
    - 3. Fire alarm system
    - 4. Grounding
  - O. The equipment supplier shall document the performance of his equipment.
  - P. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.
  - Q. Equipment Suppliers
    - 1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.
    - 2. Assist in equipment testing per agreements with Electrical Subcontractors.
    - 3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
  - R. Refer to Division 01 Section "General Commissioning Requirements" for additional Electrical Subcontractor responsibilities.
- 3.03 CxA'S RESPONSIBILITIES
- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's Responsibilities.
- 3.04 TESTING PREPARATION
- A. Certify in writing to the CxA that Electrical systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
  - B. Certify in writing to the CxA that Electrical instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
  - C. Certify in writing that testing procedures have been completed and that testing reports have been submitted, discrepancies corrected, and corrective work approved.
  - D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
  - E. Inspect and verify the position of each device and interlock identified on checklists.

- F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
- G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

### 3.05 GENERAL TESTING REQUIREMENTS

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.
- B. Scope of Electrical testing shall include the entire Electrical installation, from the incoming power equipment throughout the distribution system. Testing shall include measuring, but not limited to resistance, voltage, and amperage of system(s) and devices.
- C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- D. The CxA along with the Electrical Subcontractor and other contracted subcontractors, including the fire alarm Subcontractor shall prepare detailed testing plans, procedures, and checklists for Electrical systems, subsystems, and equipment.
- E. Tests will be performed using design conditions whenever possible.
- F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- G. The CxA may direct that set points be altered when simulating conditions is not practical.
- H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
- I. If tests cannot be completed because of a deficiency outside the scope of the Electrical system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.
- J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

### 3.06 ELECTRICAL SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

- A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 26 sections. Provide submittals, test data, inspector record, infrared camera and certifications to the CA.
- B. Electrical Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 26 Sections "Instrumentation and Control" and "Sequence of Operations" Assist the CxA with preparation of testing plans.
- C. Emergency Generator Testing and Acceptance Procedures: Provide technicians, load banks, infrared cameras, instrumentation, tools and equipment to test performance of designated systems and devices at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.
- D. Fire Detection and Alarm System Testing: Provide technicians, instrumentation, tools and equipment to test performance of designated systems and devices at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.
- E. Electrical Distribution System Testing: Provide technicians, load banks, infrared cameras, instrumentation, tools and equipment to test performance of designated systems and devices at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item to be tested
- F. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The following equipment and systems shall be evaluated:

|   |
|---|
| <b>Electrical Power Systems</b>   |
| Electrical service and switchgear   |
| Transformers  |
| Electrical distribution systems   |
| Emergency and standby power systems including automatic transfer switching systems  |
| Lighting and lighting control systems (associated with interior lighting, which also includes the theatre and TV Studio lighting) |
| Low voltage systems (lighting controls and transformers)  |
| Grounding and bonding systems   |
| Interfaces to automated temperature/building automation control systems   |
|   |
| <b>Life Safety Systems</b>  |
| Fire alarm systems  |
| Egress lighting   |

- 3.07 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT
- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.
- 3.08 APPROVAL
- A. Refer to Division 01 Section "General Commissioning Requirements" for approval procedures.
- 3.09 DEFERRED TESTING
- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deferred testing.
- 3.10 OPERATION AND MAINTENANCE MANUALS
- A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements as stated in Division 01.
- B. Refer to Division 01 Section "General Commissioning Requirements" for the AE and CxA roles in the Operation and Maintenance Manual contribution, review and approval process.
- 3.11 TRAINING OF OWNER PERSONNEL
- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to training.

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SECTION 27 08 00

COMMISSIONING OF COMMUNICATION SYSTEMS

**PART 1 – GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.

1.02 SUMMARY

- A. This section includes commissioning process requirements for communication systems, assemblies and equipment.
- B. Related Sections:
  - 1. Division 01 Section “General Commissioning Requirements” for general commissioning process requirements.

1.03 DESCRIPTION

- A. Refer to Division 01 Section “General Commissioning Requirements” for the description of commissioning.

1.04 DEFINITIONS

- A. Refer to Division 01 Section “General Commissioning Requirements” for definitions.

1.05 SUBMITTALS

- A. Refer to Division 01 Section “General Commissioning Requirements” for CxA's role.
- B. Refer to Division 01 Section “Submittals” for specific requirements. In addition, provide the following:
- C. Certificates of readiness
- D. Certificates of completion of installation, prestart, and startup activities
- E. O&M manuals
- F. Test Reports.

1.06 QUALITY ASSURANCE

- A. Test Equipment Calibration Requirements: Contractors will comply with test manufacturer' calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.07 COORDINATION

- A. Refer to Division 01 Section “General Commissioning Requirements” for requirements pertaining to coordination during the commissioning process.

## PART 2 – PRODUCTS

### 2.01 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Contractor for the equipment being tested. For example, the communication contractor of Division 27 shall ultimately be responsible for all standard testing equipment for the communication system in Division 27. A sufficient quantity of two-way radios shall be provided by each subcontractor.
- B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the base bid price to the Owner and left on site, except for stand-alone data logging equipment that may be used by the CxA.
- C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.
- D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

## PART 3 – EXECUTION

### 3.01 GENERAL DOCUMENTATION

- A. With assistance from the installing contractors, the CxA will prepare Pre-Functional Checklists for all commissioned components, equipment, and systems.
- B. **Red-lined Drawing:** The communication system contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawing. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings. The contracted party, as defined in the Contract Documents will create the as-built drawings.
- C. **Operation and Maintenance Data:** Communication System Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems. The CxA will review the O&M literature once for conformance to project requirements. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.
- D. **Demonstration and Training:** Communication System Contractor will provide demonstration and training as required by the specifications. A complete training plan and schedule must be submitted by the contractor to the CxA four weeks (4) prior to any training. A training agenda for each training session must be submitted to the CxA one (1) week prior to the training session.

### 3.02 COMMUNICATION SYSTEM CONTRACTOR'S RESPONSIBILITIES

- A. Perform commissioning tests at the direction of the CxA.
- B. Attend construction phase controls coordination meetings.
- C. Participate in communication systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
- D. Provide information requested by the CxA for final commissioning documentation.
- E. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.

- F. Prepare preliminary schedule for Communication system orientations and inspections, operation and maintenance manual submissions, training sessions, equipment start-up task completion for owner. Distribute preliminary schedule to commissioning team members.
  - G. Update schedule as required throughout the construction period.
  - H. Assist the CxA in all verification and functional performance tests.
  - I. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
  - J. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA 45 days after submittal acceptance.
  - K. Coordinate with the CxA to provide 48-hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
  - L. Participate in, and schedule vendors and contractors to participate in the training sessions.
  - M. Provide written notification to the CM/GC and CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.
    - 1. Communication Systems (example: cabling, routers, switches, fiber patch panels, software, fiber-optic cable, server racks, CAT 5E cable, CAT 6 cable, CAT 6a cable, computers, etc. to provide entire communication network) and all other equipment furnished under this Division.
  - N. The equipment supplier shall document the performance of his equipment.
  - O. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.
  - P. Equipment Suppliers
    - 1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.
    - 2. Assist in equipment testing per agreements with contractors.
    - 3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
  - Q. Refer to Division 01 Section "General Commissioning Requirements" for additional Contractor responsibilities.
- 3.03 CxA'S RESPONSIBILITIES
- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's Responsibilities.
- 3.04 TESTING PREPARATION
- A. Certify in writing to the CxA that communication systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
  - B. Certify in writing to the CxA that communication instrumentation and controls have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
  - C. Certify in writing that testing procedures have been completed and that testing reports have been submitted, discrepancies corrected, and corrective work approved.
  - D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
  - E. Inspect and verify the position of each device and interlock identified on checklist.
  - F. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.
- 3.05 GENERAL TESTING REQUIREMENTS
- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

- B. Scope of Communication systems testing shall include the entire communication equipment installation, from the incoming equipment throughout the distribution system. Testing shall include all equipment and devices.
- C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- D. The CxA along with the communications contractor(s) and other contracted subcontractors, shall prepare detailed testing plans, procedures, and checklists for communication systems, subsystems, and equipment.
- E. Tests will be performed using design conditions whenever possible.
- F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
- G. The CxA may direct that set points be altered when simulating conditions is not practical.
- H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
- I. If tests cannot be completed because of a deficiency outside the scope of the Communication system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.
- J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.06 COMMUNICATION SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

- A. **Equipment Testing and Acceptance Procedures:** Testing requirements are specified in individual Division 27 sections. Provide submittals, test data, inspector record and certifications to the CA.
- B. **Communication System Testing:** Field testing plans and testing requirements are specified in Division 27 Sections. Assist the CxA with preparation of testing plans.
- C. **Communication System Testing:** Provide technicians, instrumentation, tools and equipment to test performance of designated systems and devices at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item to be tested.
- D. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The following equipment and systems shall be evaluated:
  - 1. Master clock system
  - 2. Public address system
  - 3. Coordination and functionality with the Building Automation System/Building Management Controls System, if applicable

3.07 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.

3.08 APPROVAL

- A. Refer to Division 01 Section "General Commissioning Requirements" for approval procedures.

3.09 DEFERRED TESTING

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deferred testing.

3.10 OPERATION AND MAINTENANCE MANUALS

- A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements as stated in Division 01.

- B. Refer to Division 01 Section "General Commissioning Requirements" for the AE and CxA roles in the Operation and Maintenance Manual contribution, review and approval process.

3.11 TRAINING OF OWNER PERSONNEL

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to training.

**END OF SECTION**

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SECTION 28 08 00

COMMISSIONING OF ELECTRONIC SAFETY AND SECURITY

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this section.
- B. The OPR and BOD documentation are included by reference for information only.

1.02 SUMMARY

- A. This section includes commissioning process requirements for Electronic systems, assemblies, and equipment.
- B. Related Sections:
  - 1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.03 DESCRIPTION

- A. Refer to Division 01 Section "General Commissioning Requirements" for the description of commissioning.

1.04 DEFINITIONS

- A. Refer to Division 01 Section "General Commissioning Requirements" for definitions.

1.05 SUBMITTALS

- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's role.
- B. Refer to Division 01 Section "Submittals" for specific requirements. In addition, provide the following:
- C. Certificates of readiness
- D. Certificates of completion of installation, prestart, and startup activities.
- E. O&M manuals
- F. Test reports

1.06 QUALITY ASSURANCE

- A. Test Equipment Calibration Requirements: Contractors will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.07 COORDINATION

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to coordination during the commissioning process.

## PART 2 - PRODUCTS

### 2.01 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup, initial checkout and functional performance testing shall be provided by the Electronic Safety and Security System Contractor for the equipment being tested. For example, the contractor of Division 28 shall ultimately be responsible for all standard testing equipment for the electronic systems in Division 28. A sufficient quantity of two-way radios shall be provided by each contractor.
- B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the base bid price to the Owner and left on site, except for stand-alone data logging equipment that may be used by the CxA.
- C. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.
- D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

## PART 3 - EXECUTION

### 3.01 GENERAL DOCUMENTATION REQUIREMENTS

- A. With assistance from the installing contractors, the CxA will prepare Pre-Functional Checklists for all commissioned components, equipment, and systems
- B. **Red-lined Drawings:** The Electronic Safety and Security System contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings. The contracted party, as defined in the Contract Documents will create the as-built drawings.
- C. **Operation and Maintenance Data:** Electronic Safety and Security System Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems. The CxA will review the O&M literature once for conformance to project requirements. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.
- D. **Demonstration and Training:** Electronic Safety and Security System Contractor will provide demonstration and training as required by the specifications. A complete training plan and schedule must be submitted by the Electronic Safety and Security System Contractor to the CxA four weeks (4) prior to any training. A training agenda for each training session must be submitted to the CxA one (1) week prior the training session.

### 3.02 ELECTRONIC SAFETY and SECURITY SYSTEM CONTRACTOR'S RESPONSIBILITIES

- A. Perform tests as required by Division 28.
- B. Attend construction phase controls coordination meetings.
- C. Participate in Electronic systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CA.
- D. Provide information requested by the CxA for final commissioning documentation.
- E. Include requirements for submittal data, operation and maintenance data, and training in each purchase order or sub-contract written.



- F. Prepare preliminary schedule for Electronic system orientations and inspections, operation and maintenance manual submissions, training sessions, equipment start-up and task completion for owner. Distribute preliminary schedule to commissioning team members.
- G. Update schedule as required throughout the construction period.
- H. Assist the CxA in all verification and functional performance tests.
- I. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
- J. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA 45 days after submittal acceptance.
- K. Coordinate with the CxA to provide 48-hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
- L. Notify the CxA a minimum of two weeks in advance of the time for start of the testing and balancing work. Attend the initial testing and balancing meeting for review of the official testing and balancing procedures.
- M. Participate in, and schedule vendors and contractors to participate in the training sessions.
  - 1. Provide written notification to the CM/GC and CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.
  - 2. Security system.
- N. The equipment supplier shall document the performance of his equipment.
- O. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.
- P. Equipment Suppliers
  - 1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner, to keep warranties in force.
  - 2. Assist in equipment testing per agreements with contractors.
  - 3. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
- Q. Refer to Division 01 Section "General Commissioning Requirements" for additional Contractor responsibilities.

### 3.03 CxA'S RESPONSIBILITIES

- A. Refer to Division 01 Section "General Commissioning Requirements" for CxA's Responsibilities.

### 3.04 TESTING PREPARATION

- A. Certify in writing to the CxA that Electronic systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.
- B. Certify in writing to the CxA that Electronic instrumentation and controls have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.
- C. Certify in writing that testing procedures have been completed and that testing reports have been submitted, discrepancies corrected, and corrective work approved.
- D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
- E. Inspect and verify the position of each device and interlock identified on checklists.
- F. Check safety cutouts, alarms, and interlocks with building automation, smoke control and life-safety systems during each mode of operation.
- G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

### 3.05 GENERAL TESTING REQUIREMENTS

- A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.
  - B. Scope of Electronic testing shall include the entire Electronic system installation, from the incoming power equipment throughout to each peripheral and end device. Testing shall include measuring, but not limited to resistance, voltage, and amperage of system(s) and devices.
  - C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
  - D. The CxA along with the Electronic Safety and Security System contractor and other contracted subcontractors, including the fire alarm Subcontractor shall prepare detailed testing plans, procedures, and checklists for Electronic systems, subsystems, and equipment.
  - E. Tests will be performed using design conditions whenever possible.
  - F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
  - G. The CxA may direct that set points be altered when simulating conditions is not practical.
  - H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.
  - I. If tests cannot be completed because of a deficiency outside the scope of the Electronic system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.
  - J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.
- 3.06 SECURITY SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES
- A. **Equipment Testing and Acceptance Procedures:** Testing requirements are specified in individual Division 28 sections. Provide submittals, test data, inspector record, infrared camera or special equipment and certifications to the CA.
  - B. **Electronic Instrumentation and Control System Testing:** Field testing plans and testing requirements are specified in Division 28 Sections. Assist the CxA with preparation of testing plans.
  - C. **Electronic System Testing (Access Control, CCTV and/or Security):** Provide technicians, instrumentation, tools and equipment to test performance of designated systems and devices at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item to be tested.
  - D. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The following equipment and systems shall be evaluated:
    - 1. Coordination and functionality with the Building Automation System/Building Management Controls System
    - 2. Security System including switches, servers or routers
- 3.07 DEFICIENCIES/NON-CONFORMANCE, COST OF RETESTING, FAILURE DUE TO MANUFACTURER DEFECT
- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deficiencies/non-conformance, cost of retesting, or failure due to manufacturer defect.
- 3.08 APPROVAL
- A. Refer to Division 01 Section "General Commissioning Requirements" for approval procedures.

3.09 DEFERRED TESTING

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to deferred testing.

3.10 OPERATION AND MAINTENANCE MANUALS

- A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements as stated in Division 01.
- B. Refer to Division 01 Section "General Commissioning Requirements" for the AE and CxA roles in the Operation and Maintenance Manual contribution, review and approval process.

3.11 TRAINING OF OWNER PERSONNEL

- A. Refer to Division 01 Section "General Commissioning Requirements" for requirements pertaining to training.

**END OF SECTION**

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Section 31 10 00  
SITE CLEARING

**PART 1 - GENERAL**

**1.1 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

**1.2 DESCRIPTION OF WORK**

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:
  - 1. Protecting existing trees and vegetation to remain, including temporary fencing for trees in close proximity to construction operations.
  - 2. Removing existing trees and vegetation indicated to be removed.
  - 3. Clearing and grubbing.
  - 4. Stripping and stockpiling topsoil.
  - 5. Removing above and below grade site improvements.
  - 6. Protection of Existing Utilities.
  - 7. Utility Demolition as required to accommodate new construction.
  - 8. Protection and Abandonment of Utilities.
  - 9. Disconnecting, capping or sealing of utilities as required.
- B. Alternates: Not Applicable.
- C. Items to Be Installed Only: Not Applicable.
- D. Items to Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
  - 1. Section 31 20 00 – EARTH MOVING for soil materials, excavating, backfilling, and site grading and removal of site utilities.
  - 2. Section 31 25 00 – EROSION AND SEDIMENTATION CONTROLS for required erosion and sedimentation control measures.

**1.3 DEFINITIONS**

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 MATERIAL OWNERSHIP

- A. Except for stripped topsoil or other materials indicated to remain the Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

- A. Refer to SECTION 01 33 00 – SUBMITTALS for submittal provisions and procedures.
  - 1. Schedule indicating proposed sequence of operations for demolition work for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise protection.
    - a. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
    - b. Coordinate with Owner's continuing occupation of portions of existing building, adjacent buildings, and with Owner's partial occupancy of completed portions of proposed building or additions.
  - 2. Preconstruction survey photographs sufficiently detailed, of existing conditions of existing buildings, trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. Record drawings, according to Section 01 77 00 - CONTRACT CLOSEOUT identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from the Owner's Representative and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on the Owner's premises where indicated.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- D. Do not commence site clearing operations until erosion and sedimentation control measures are in place.
- E. Protection of Existing Improvements: Provide protection necessary to prevent damage to existing improvements indicated to remain in place or outside of the limit of work. Protect improvements on adjoining properties and on the Owner's property.
  - 1. Restore improvements damaged by Contractor's clearing activities to their original condition, at no additional expense to the Owner.

1.7 EXAMINATION OF SITE AND DOCUMENTS

- A. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of a lack of knowledge of existing conditions as indicated in the Construction Documents, or obvious from observation of the site.
- B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period and formed his own conclusions as to the full requirements of the work involved.

**PART 2-PRODUCTS (NOT USED)**

**PART 3-EXECUTION**

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly flag trees and vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to the Owner's Representative.

3.2 TREE PROTECTION

- A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.
  - 1. Do not store construction materials, debris, or excavated material within fenced area.
  - 2. Do not permit vehicles, equipment, or foot traffic within fenced area.
  - 3. Maintain fenced area free of weeds and trash.
  - 4. Except as otherwise directed, cutting and trimming of existing trees will not be permitted.
- B. Do not excavate within tree protection zones, unless otherwise indicated.
- C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
  - 1. Cover exposed roots with burlap and water regularly.
  - 2. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
  - 3. Coat cut faces of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
  - 4. Backfill with soil as soon as possible.
- D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by the Designer.

1. Employ an arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the Designer.

### 3.3 UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
  1. Arrange with utility companies to shut off indicated utilities. The Contractor is responsible for coordinating and scheduling with the authorities having jurisdiction the removal and/or abandonment of existing utilities as required to complete the work.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner's Representative or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  1. Notify the Owner's Representative not less than two days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without the Owner's Representative's written permission.
- C. Utility pipes designated to be abandoned in place shall be plugged at their ends with watertight brick masonry or cement mortar with a minimum thickness of 8 inches.
- D. Utility pipes designated to be removed shall consist of the complete removal and disposal of the entire length of pipe and backfill and compaction of the void with ordinary borrow. When the void is within the footprint of the new building, gravel borrow shall be used to backfill the void.
- E. Utility structures designated to be abandoned in place shall have their cast iron castings removed and disposed, inlet and outlet pipes plugged, the bottom of the structures shall be broken, the void of the structure shall be backfilled and compacted with ordinary borrow, and the top of the structure shall be removed so that it is at least 36 inches below finished grade.
- F. Utility structures designated to be removed shall consist of the removal and disposal of cast iron castings, plugging of inlet and outlet pipes, removal of the structure, and backfill and compaction of the void with ordinary borrow. When the void is within the footprint of the new building, gravel borrow shall be used to backfill the void.

### 3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
  1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
  2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
  3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
  4. Use only hand methods for grubbing within tree protection zone.
  5. Chip removed tree branches and dispose of off-site.



- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

- 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

### 3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
  - 1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust or contamination by airborne weed seed.
  - 1. Limit height of topsoil stockpiles to 72 inches.
  - 2. Do not stockpile topsoil within tree protection zones.

### 3.6 EXCESS TOPSOIL

- A. Topsoil that has been stripped and stockpiled, but is not needed after the completion of all final topsoil spreading and grassing, shall be removed and legally disposed of off-site by the Contractor per local, state, and federal standards.

### 3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
  - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
  - 2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

### 3.8 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off the Owner's property.
  - 1. Burning on site is prohibited.
  - 2. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

### 3.9 CLEANUP AND REPAIR

- A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site.

- B. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by site demolition work.

End of Section

Section 31 20 00  
EARTH MOVING

**PART 1 - GENERAL**

**1.1 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

**1.2 DESCRIPTION OF WORK**

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section (excluding earthwork for building and retaining wall construction), including but not limited to the following:
1. Excavation, backfill, and compaction for pavements, pads, utility trenches and structures, and landscaping.
  2. Preparation and protection of subgrades.
  3. Removal of underground utilities as applicable.
  4. Excavation of all unsuitable materials encountered below indicated subgrade elevations.
  5. Placement of subbase course for concrete pavements.
  6. Placement of subbase and base course for asphalt paving.
  7. Bedding for utility trenches.
  8. Dewatering and support of excavation of trenches and excavations.
  9. Removal of items covered by Section 01 22 00 - UNIT PRICES as applicable.
  10. Disposal of unsuitable or excess excavated material.
  11. Coordinate with all trades for complete building and site utility systems.
  12. Coordination with maintenance of safe path of travel for the public.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. SECTION 31 10 00 - SITE CLEARING for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements.
  2. SECTION 31 25 00 – EROSION AND SEDIMENTATION CONTROLS for temporary erosion and sedimentation control measures.
  3. Division 02, 22, 23, and 26 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
  4. SECTION 33 10 00 – WATER UTILITIES for installing underground water pipes, valves, hydrants, and appurtenances.
  5. SECTION 33 30 00 – SANITARY SEWERAGE UTILITIES for installing underground sewer pipes and manholes.
  6. SECTION 33 40 00 – STORM DRAINAGE UTILITIES for installing underground drain pipes, manholes, area drains, water quality structures, and water storage tanks.

**1.3 UNIT PRICES**

- A. Unit prices for certain types of earthwork are included in Section 01 22 00 - UNIT PRICES.

- B. Rock Measurement: Volume of rock actually removed. Unit prices for rock excavation include replacement with approved materials.

#### 1.4 DEFINITIONS

- A. Backfill: Soil material or Controlled Density Fill (CDF) used to fill an excavation.
  - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Course placed between the subbase course and hot-mix asphalt paving and concrete paving.
- C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Dewatering includes lowering the water table and intercepting seepage which would otherwise emerge from the slopes or bottom of the excavation; increasing the stability of excavated slopes; preventing loss of material from beneath the slopes or bottom of the excavation; reducing lateral loads on sheeting and bracing; improving the excavation and hauling characteristics of sandy soil; preventing rupture of heaving of the bottom of any excavation; and disposing of pumped water.
  - 1. Normal dewatering is defined as using conventional pumps installed in open excavations ditches, or sumps.
- F. Drainage Course: Course supporting the pavement that also minimizes upward capillary flow of pore water.
- G. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
  - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by the Owner's Representative or the Designer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
  - 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
  - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by the Owner's Representative or the Designer. Unauthorized excavation, as well as remedial work directed by Designer, shall be without additional compensation.
- H. Fill: Soil materials used to raise existing grades.
- I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that cannot be removed by normal rock excavating equipment without systematic drilling, ram hammering, ripping, or blasting, when permitted.

- J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- K. Subbase Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- L. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- M. Utilities: Onsite underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- N. Unsuitable Soils: Excavated soils that are determined by the Designer to not be reusable as fill or backfill on-site due to gradation, moisture content, and/or the presence of deleterious materials.

#### 1.5 SUBMITTALS

- A. Product Data: For the following:
  - 1. Each type of plastic warning tape.
  - 2. Geotextile.
  - 3. Controlled Density Fill, including design mixture.
- B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
  - 1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
  - 2. Laboratory compaction curve according to ASTM D 1557 for each onsite and borrow soil material proposed for fill and backfill.
- C. Dewatering system: Contractor shall submit, for record, drawings and design data prepared, stamped, and signed by a registered professional engineer in the Commonwealth of Massachusetts who is experienced in groundwater control system design. The submittal shall show arrangement locations, and details of wells and well points and sump pumps; locations of risers, headers, filters, pumps, power units, all treatment components, and discharge lines; and means of discharge, control of sediment, and disposal of water. The submittal of the dewatering system will not relieve the Contractor from the responsibility for the adequacy of the dewatering system to achieve the required results specified in these Specifications and all permit requirements.
  - 1. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
  - 2. Include a written plan for dewatering operations including control procedures to be adapted if dewatering problems arise.
  - 3. Include design calculations demonstrating adequacy of the proposed dewatering system and equipment.
  - 4. Provisions and methods of sediment removal and disposal of water.
  - 5. All permits required for the work.

- D. Support of Excavation: Contractor shall submit, for record, proposed excavation support systems (if required). The proposed lateral support systems shall be designed and stamped by a registered professional engineer licensed in the Commonwealth of Massachusetts. Despite the submittal of the design of excavation support and protection systems, the Contractor shall remain solely responsible for the adequacy and safety of materials and methods used in construction. Include the following as a minimum on the drawings:
1. Details, arrangements, and methods of construction of the proposed system(s).
  2. The method of installation and installation equipment.
  3. The elevation of struts, shores, and tiebacks, as applicable, and permissible depth to which excavation may be carried before such supports are installed.
  4. The excavation depths, the depth below the main excavation to which the support system will be installed, and the maximum design load to be carried by various members of the support system.
  5. Design calculations including references to design methods used, assumptions, design parameters, design soil profile, material properties, allowable stresses, and other pertinent information stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.
  6. The location of existing utilities, facilities and/or structures nearby.
- E. Pre-excavation Photographs and Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins. Maintain catalog of up-to-date photographs at the site.
- F. Plan to Maintain Safe Path of Travel: Submit plans for maintaining safe paths of travel for the general public during the entire project, including requirement for police details if necessary.

#### 1.6 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others unless permitted in writing by the Owner's Representative and then only after arranging to provide temporary utility services according to requirements indicated.
1. Notify the Owner's Representative not less than two days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without the Owner's Representative's written permission.
  3. Contact utility-locator service for area where Project is located before excavating.
    - a. The Contractor shall notify "Dig Safe" at 1-888-DIG-SAFE prior to commencing any excavation work.
- B. Demolish and completely remove from site existing underground utilities and structures indicated to be removed. Coordinate with utility companies to shut off services if lines are active.
- C. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of

analyses conducted by geotechnical engineer. Neither the Owner nor the Geotechnical Engineer will be responsible for interpretations or conclusions drawn from the data.

1. The geotechnical report does not represent, and shall not be construed to represent a guarantee of subsurface conditions.
  2. Interpretation of this data for purposes of construction is the responsibility of the Contractor. It is the Contractor's responsibility to make interpretations and draw conclusions with respect to the character of materials to be encountered and groundwater conditions at the site and their impact upon Contractor's work based on his expert knowledge of the area, construction dewatering methods, and support of excavation methods.
  3. Make additional test borings and conduct other exploratory operations necessary for dewatering and excavation support and protection.
  4. The geotechnical report is referenced elsewhere in the Project Manual.
- D. Survey Work: Contractor shall engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
1. During earth moving operations, installation of excavation support and protection systems and dewatering, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Owner's Representative if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.
- E. The Contractor shall not close or obstruct any street, sidewalk, or passageway without written permission from authorities having jurisdiction unless otherwise indicated on the Contract Drawings. The Contractor shall conduct the construction operations as to minimize interference with the use of roads, driveways, or other facilities near enough to the project to be affected by the work.
- F. The Contractor shall provide police details when working in roadways as required by local jurisdictional authorities. The Contractor shall pay for any and all police details.

#### 1.7 EXCAVATION SUPPORT AND PROTECTION

- A. The Contractor shall furnish, install, monitor and maintain excavation support and protection systems (sheeting, shoring, and bracing) at locations necessary to support the sides of excavations and resist soil and hydrostatic pressure and superimposed and construction loads; to prevent danger to persons or damage to adjacent pavements, facilities, utilities, or structures; to prevent injurious caving or erosion or the loss of ground; and to maintain pedestrian and vehicular traffic as required by the Contract Documents, the Contractor's sequence of construction, and as directed by the Owner's Representative.
- B. In all sheeting, shoring and bracing operations, care shall be taken to prevent collapse of excavations, injury to persons or damage to adjacent structures, facilities, utilities, and services. Any injuries to persons shall be the responsibility of the Contractor; and any damage to the work occurring as a result of settlement, water or earth pressure, or other causes due to inadequate bracing or other construction operations of the Contractor shall be satisfactorily repaired and made good by the Contractor, at no additional cost to the Owner.

- C. The excavation support system shall be of sufficient strength and be provided with adequate bracing to support all loads to which it will be subjected. The excavation support system shall be designed to prevent any movement of earth that would diminish the width of the excavation or damage or endanger adjacent structures.
- D. Where sheeting is to be used, it shall be driven ahead of excavation operations to the extent practicable so as to avoid the loss of material from behind the sheeting; where voids occur outside of the sheeting, they shall be filled immediately with ordinary fill, thoroughly compacted.
- E. The Contractor shall leave in place all sheeting and bracing at the locations and within the limits ordered by the Owner's Representative in writing. The Contractor shall cut off the sheeting at elevations as indicated on the Contract Drawings or be determined with the approval of the Owner's Representative.
- F. The Contractor shall comply with all federal, state, and local safety regulations, and requirements.

#### 1.8 DEWATERING

- A. The Contractor shall provide, at his own expense, adequate pumping and drainage facilities to maintain the excavated area sufficiently dry from groundwater and/or surface runoff so as not to adversely affect construction procedures nor cause excessive disturbance of underlying natural ground. The flows of all water resulting from pumping shall be managed so as not to cause erosion, siltation of drainage systems, or damage to adjacent property.
- B. Any damage resulting from the failure of the dewatering operations of the Contractor, and any damage resulting from the failure of the Contractor to maintain all the areas of work in a suitable dry condition, shall be repaired by the Contractor, as directed by the Owner's Representative and/or the Designer, at no additional cost to the Owner. The Contractor's pumping and dewatering operations shall be carried out in such a manner as to prevent damage to the Contract work and so that no loss of ground will result from these operations. Precautions shall be taken to protect new work from flooding during storms or from other causes. Pumping shall be continuous to protect the work and/or to maintain satisfactory progress.
- C. All pipelines or structures not stable against uplift during construction or prior to completion shall be thoroughly braced or otherwise protected. Water from the trenches, excavations, and stormwater management operations shall be disposed of in such a manner as to avoid public nuisance, injury to public health or the environment, damage to public or private property or damage to the work completed or in progress.
- D. The Contractor shall control the grading in the areas surrounding all excavations so that the surface of the ground will be properly sloped to prevent water from running into the excavated area. Where required, temporary ditches shall be provided to control drainage. Upon completion of the work and when directed, all areas shall be restored by the Contractor in a satisfactory manner and as directed.
- E. Remove dewatering system when no longer required for construction.
- F. The Contractor shall obtain and maintain all required local, state, and federal permits necessary for construction dewatering for the duration of dewatering activities including all chemical testing required for disposal and discharge of dewatering effluent. The Contractor



tor shall be responsible for treatment of water, if necessary, to meet minimum discharge criteria specified in the permits.

1.9 QUALITY CONTROL

- A. Inspection and testing will be performed by the Contractor to ensure that the materials placed meet the requirements in this section. Fill materials imported from off-site sources shall be chemically and geotechnically tested once for every 2,000 tons of material.
- B. If fill soils are not obtained from a commercial gravel pit, the Contractor shall provide certified analytical testing of offsite backfill to demonstrate that the soil does not exceed the limitations for MCP reference/reportable concentrations. Analyses shall include RCRA-8 metals, Extractable and Volatile Petroleum Hydrocarbons (EPH/VPH), and Volatile Organic Compounds (by EPA Method 8260B/5035). No testing will be required of imported fill soils obtained from a commercial gravel pit, provided the soils are free of odors, discoloration, staining or other conditions indicative of contamination, in the opinion of the Geotechnical Engineer and/or the Designer.
- C. Tests and analysis of soil material will be performed in accordance with ASTM D422, ASTM D1557, ASTM D2922, ASTM D3017 and ASTM D4318.
- D. If tests indicate materials do not meet specified requirements, the Contractor shall identify an alternative borrow source, test the new material, and submit results to the Designer at no cost to Owner.

1.10 LAYOUT AND GRADES

- A. The Contractor is responsible for establishing vertical and horizontal control for the work and shall establish permanent benchmarks and replace as directed any, which are destroyed or disturbed. The Contractor shall maintain sufficient reference points at all times during construction to properly perform site grading. The existing survey benchmark shall be protected throughout the construction project.
- B. Finished grades, contours, and elevations indicated on the Drawings describe final surface elevation for completed construction. The words "finished grade" as used herein shall mean final grade elevations indicated on the Drawings. Spot elevations shall govern over proposed contours. Where not otherwise indicated, project site areas shall be given uniform slope between points and existing established grades.

1.11 QUALITY ASSURANCE

- A. Field inspection and testing may be performed by a Geotechnical Engineer at the Owner's expense to supplement the Contractor's Quality Control testing. Classification of all materials will be made by the Geotechnical Engineer whose decision shall be final and binding on the Contractor.
- B. The Contractor shall be responsible for managing and tracking all materials excavated and placed in stockpiles for testing.
- C. Comply with governing EPA notification regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. The Contractor is responsible for the adequacy of the dewatering systems.

1. The dewatering systems shall be capable of effectively reducing the hydrostatic pressure and lowering the groundwater levels to a minimum of 2 feet below excavation bottom unless otherwise directed by the Designer so that all excavation bottoms are firm and dry.
  2. The dewatering system shall be capable of maintaining a dry and stable subgrade until the structures, pipes, and appurtenance to be built therein have been completed to the extent that they will not be floated or otherwise damaged.
  3. The dewatering system and excavation support shall be designed so that the lowering of the groundwater level outside the excavation does not adversely affect adjacent structures, utilities or other improvements.
- E. The Owner will perform in place density tests in accordance with ASTM D2922 or D3017 as the Work progresses, to determine the degree of compaction. Any corrective work required as a result of such tests, such as additional compaction, or a decrease in the thickness of layers, shall be performed by the Contractor at no additional expense to Owner. In place, density testing shall be made at the Contractor's expense by a qualified geotechnical testing laboratory.
- F. The Designer's duties do not include the supervision or direction of the actual work by the Contractor, his employees or agents. Neither the presence of the Designer nor any observation and testing by the Geotechnical Engineer shall excuse the Contractor from defects discovered in his Work at that time or subsequent to the testing.
- G. Contractor shall assist the Owner's Testing Laboratory in performing in-place density testing at a minimum frequency of one test per lift but no less than one test per 200 cubic yards of material placed in any one lift. Compaction testing will be performed in accordance with ASTM D1557, D2922, and D3017.
- H. Subgrades shall be approved for compactness and material composition prior to placing subsequent lifts. If inspections indicate Work does not meet specified requirements, the work shall be removed, replaced, and compacted at no additional cost to Owner.

#### 1.12 REGULATORY REQUIREMENTS

- A. Comply with the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations (454 CMR 10.0 et seq.). Contractors shall be familiar with the requirements of these regulations.
1. All excavations shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P), State, and local requirements. Where conflict between OSHA, State, and local regulations exist, the most stringent requirements shall apply.
- B. Comply with governing EPA notification regulations before, during, and upon completion of dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Comply with all rules, regulations, laws, and ordinances of the municipality, the Commonwealth of Massachusetts, and other authorities having jurisdiction over the project site or work. All labor, materials, equipment, and services necessary to make the work comply with requirements shall be provided by the Contractor without additional cost to the Owner.

- D. The Contractor shall obtain and pay for all permits and licenses required to complete the work specified herein and indicated on the Contract Drawings.

#### 1.13 EXAMINATION OF SITE AND DOCUMENTS

- A. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of a lack of knowledge of existing conditions as indicated in the Contract Documents, or obvious from observation of the site.
- B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period and formed his own conclusions as to the full requirements of the work involved.

### PART 2-PRODUCTS

#### 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Ordinary Borrow: Ordinary borrow shall meet the requirements of MassDOT M1.01.0. It shall be well-graded, natural inorganic soil containing no stone greater than 6 inches maximum dimension. The materials shall be free of trash, ice, snow, tree stumps, roots, and other organic and deleterious materials. It shall be free of highly plastic clays, of all materials subject to decay, or other materials that will corrode piping or metals. Ordinary borrow shall have a maximum dry density of not less than 110 pounds per cubic foot. It shall be of such a nature and character that it can be compacted to the specified densities. Topsoil shall not be considered ordinary borrow. Existing available fill materials from onsite excavations may be reused as ordinary borrow if it meets the above requirements. It shall be graded within the following limits:

| <u>U. S. Standard Sieve Size</u> | <u>Percent Finer by Weight</u> |
|----------------------------------|--------------------------------|
| 6 inch                           | 100                            |
| No. 10                           | 30-90                          |
| No. 40                           | 10-70                          |
| No. 200                          | 0-15                           |

- E. Gravel Borrow: Gravel borrow shall meet the requirements of MassDOT M1.03.0, Type B. It shall be an inert, hard, durable sand and gravel or stone soil obtained from an offsite

commercial source. It shall be free of ice, snow, roots, sod, rubbish, oil, hazardous material, and other deleterious or organic matter. It shall be graded within the following limits:

| <u>U. S. Standard Sieve Size</u> | <u>Percent Finer by Weight</u> |
|----------------------------------|--------------------------------|
| 3 inch                           | 100                            |
| ½ inch                           | 50-85                          |
| No. 4                            | 40-75                          |
| No. 50                           | 8-28                           |
| No. 200                          | 0-8                            |

- F. ¾" Crushed Stone: ¾" crushed stone shall meet the requirements of MassDOT M2.01.4. It shall consist of durable crushed rock or crushed gravel stone, free of ice, snow, sand, silt, clay, loam, shale, or other deleterious or organic matter. It shall be graded within the following limits:

| <u>U.S. Standard Sieve Size</u> | <u>Percent Finer by Weight</u> |
|---------------------------------|--------------------------------|
| 1 inch                          | 100                            |
| ¾ inch                          | 90-100                         |
| ½ inch                          | 10-50                          |
| 3/8 inch                        | 0-20                           |
| No. 4                           | 0-5                            |

- G. 1-1/2" Crushed Stone: 1-1/2" crushed stone shall meet the requirements of MassDOT M2.01.1. It shall consist of durable crushed rock or crushed gravel stone, free of ice, snow, sand, silt, clay, loam, shale, or other deleterious or organic matter. It shall be graded within the following limits:

| <u>U.S. Standard Sieve Size</u> | <u>Percent Finer by Weight</u> |
|---------------------------------|--------------------------------|
| 2 inch                          | 100                            |
| 1-1/2 inch                      | 95-100                         |
| 1 inch                          | 35-70                          |
| ¾ inch                          | 0-25                           |

- H. Dense Graded Crushed Stone: Dense graded crushed stone shall meet the requirements of MassDOT M2.01.7. It shall consist of a mixture of crusher-run aggregate of crushed stone mixed with natural sand and gravel soil obtained from an offsite commercial source. It shall be free of ice, snow, roots, sod, rubbish, soil, hazardous material, and other deleterious or organic matter. It shall be graded within the following limits:

| <u>U. S. Standard Sieve Size</u> | <u>Percent Finer by Weight</u> |
|----------------------------------|--------------------------------|
| 2 inch                           | 100                            |
| 1-½ inch                         | 70-100                         |
| ¾ inch                           | 50-85                          |
| No. 4                            | 30-55                          |
| No. 40                           | 8-24                           |
| No. 200                          | 3-10                           |

- I. Sand: Sand shall meet the requirements of MassDOT M1.04.1. It shall consist of clean inert, hard, durable grains of quartz or other hard durable rock, free from clay, organics, surface coatings, or other deleterious or organic matter. It shall be graded within the following limits:

| <u>U. S. Standard Sieve Size</u> | <u>Percent Finer by Weight</u> |
|----------------------------------|--------------------------------|
| ½ inch                           | 100                            |
| 3/8 inch                         | 85-100                         |
| No. 4                            | 60-100                         |
| No. 16                           | 35-80                          |
| No. 50                           | 10-55                          |
| No. 100                          | 2-10                           |

- J. Dumped Riprap: Stone used for dumped riprap shall be hard, durable, angular in shape stones, resistant to weathering and shall meet the gradation requirement specified. Neither breadth nor thickness of a single stone should be less than one-third its length. Rounded stone or boulders will not be accepted unless authorized by the Engineer. Each load of riprap shall be reasonably well graded from the smallest to the maximum size specified. Stone shall be free from overburden, spoil, shale, and organic material and shall conform to the following gradation with no more than 5% by weight passing a 2-inch sieve:

| <u>Weight of Stone (lbs.)</u> | <u>Percent Finer by Weight</u> |
|-------------------------------|--------------------------------|
| 400                           | 100                            |
| 300                           | 50                             |
| 200                           | 30                             |
| 25                            | 10                             |

- K. Stone for Pipe Ends: Stone for pipe ends shall be sound, curable rock which is angular in shape. Rounded stones, boulders, sandstone or similar stone or relatively thin slabs will not be acceptable. Each stone shall weigh not less than 50 pounds not more than 125 pounds and at least 75% of the volume shall consist of stones weighing not less than 75 pounds each. The remainder of the stones shall be so graded that when placed with the larger stones the entire mass will be compact.
- L. Controlled Density Fill (CDF) shall be a cement concrete backfill material that flows like a liquid, supports like a solid when cured, and levels without tamping or vibrating to reach 100 percent compaction. CDF shall meet the requirements of MassDOT Specifications M4.08.00 for Type 1E (Very Flowable, Excavatable) or type 2E (Flowable, Excavatable) CDF. The mix formulation will be submitted to the Designer for review prior to placement of the material in the project.
- M. Reuse of Excavated Rock: Excavated on-site rock materials processed by the Contractor meeting the gradation limits for ¾" Crushed Stone, 1-1/2" Crushed Stone, Dense Graded Crushed Stone, and Stone for Pipe Ends contained herein may be segregated and reused as approved by the Owner.

## 2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation

greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
  2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
  3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
  4. Tear Strength: 56 lbf; ASTM D 4533.
  5. Puncture Strength: 56 lbf; ASTM D 4833.
  6. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
  7. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Survivability: Class 2; AASHTO M 288.
  2. Grab Tensile Strength: 247 lbf; ASTM D 4632.
  3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
  4. Tear Strength: 90 lbf; ASTM D 4533.
  5. Puncture Strength: 90 lbf; ASTM D 4833.
  6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
  7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
  8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

## 2.3 ACCESSORIES

- A. Detectable Underground Warning Tapes: Acid and alkali-resistant polyethylene plastic film warning tape, 6-inches wide by 4-mils minimum thickness, with continuously printed caption in black letters "CAUTION - xxxxx LINE BURIED BELOW." The text and color of the tape shall be as shown in the table below. The tape shall have a metallic core encased in a protective jacket for corrosion protection and be detectable by a metal detector when the tape is buried up to 2.5-feet deep.

| Color                         | Utility  |
|-------------------------------|--|
| Safety Red                    | Electric                                       |
| High Visibility Safety Yellow | Gas, Oil, Steam                                |
| Safety Alert Orange           | Telephone, Communications,<br>Cable Television |
| Safety Precaution Blue        | Water System, Irrigation                       |
| Safety Green                  | Sanitary Sewer, Storm Sewer                    |
| White                         | Proposed Excavation                            |

## 2.4 USES OF MATERIALS

- A. Fill materials listed in Paragraph 2.1 above shall be utilized as follows and as otherwise indicated on the Drawings, specified or directed.
- B. Gravel Borrow:
1. As fill and base coarse soils below cement concrete and hot-mix asphalt pavements as shown on the Contract Drawings.

2. Trench backfill within paved areas.
  3. Bedding for ductile iron drain, water, and sewer piping.
- C. Dense Graded Crushed Stone:
1. As base course soils below cement concrete and hot-mix asphalt pavement as shown on the Contract Drawings.
- D. ¾-inch and 1-1/2-inch Crushed Stone:
1. Base for drain manholes, catch basins, sewer manholes, and utility structures.
  2. Bedding for drain pipe and sewer pipe.
  3. Around perforated drain lines.
  4. To stabilize wet subgrade conditions.
  5. Elsewhere as shown on the Drawings or specified herein.
  6. To aid in dewatering.
- E. Sand:
1. Bedding for drain, water, sewer, and other utility piping.
  2. Elsewhere as shown on the Drawings or specified herein.
- F. Ordinary Borrow:
1. For general site fill outside of the proposed building footprint, concrete, and bituminous concrete areas.
  2. Trench backfill material outside of paved areas.
  3. Elsewhere as shown on the Drawings or specified herein.
- G. Geotextiles:
1. Subsurface non-woven Drainage Geotextile shall fully wrap 3-4-inch Crushed Stone.
  2. Use to prevent soil intrusion into drains and/or to assist in stabilizing soil subgrades prior to placement of fill materials.
  3. Subsurface woven separation geotextile as separation material between crushed stone and gravel borrow base materials below cement concrete and hot-mix asphalt pavement as shown on the Contract Drawings.
  4. Where indicated or shown in the Contract Drawings.
- H. Controlled Density Fill (CDF):
1. CDF shall be used as shown on the Contract Drawings.
  2. CDF shall be used if directed by the DESIGNER as fill at the limits of the excavation areas.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL REQUIREMENTS**

- A. The Contract Drawings indicate the proposed finish alignment, elevation, and grade of the work. Establish the line and grade in close conformity with the Contract Drawings.

- B. The Contractor is responsible for establishing construction phasing, means, and methods and interim grading and temporary conditions required to attain the finish product required by the Contract Documents. The Contractor is responsible for all construction, protection, movement, and maintenance of stockpiles. Establish and maintain suitable benchmarks and grade control to accurately perform the work.
- C. No excavation shall be deposited or stockpiled at any time to endanger portions of new or existing structures, either by direct pressure or indirectly by overloading banks contiguous to the operation. Material, if stockpiled, shall be stored so as not to interfere with the established sequence of the construction. If there is not sufficient area available for stockpiling within the limits of the project, the Contractor will be required to furnish his own area for stockpiling.
- D. When the plans require excavation in areas in close proximity to existing buildings, roads, structures and utilities it shall be the responsibility of the Contractor at his expense to use satisfactory means and methods to protect and maintain the stability of such roads, and structures located immediately adjacent to but outside the limits of excavations.

### 3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Section 311000 - SITE CLEARING.
- C. Protect and maintain erosion and sedimentation controls, which are specified in Section 312500 – EROSION AND SEDIMENTATION CONTROLS, during earthwork operations.
- D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

### 3.3 DEWATERING

- A. Provide Dewatering as required to maintain dry excavations.
- B. Prevent surface water and groundwater from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
  - 2. Install a dewatering system to keep subgrades dry and convey groundwater away from excavations. Maintain until dewatering is no longer required.
  - 3. Where soil has been softened or eroded by flooding, equipment, traffic or placement of fill or concrete during unfavorable weather or such other conditions, it shall be removed and replaced by the Contractor with suitable material and at the Contractor's



expense. The necessity and extent of such removals shall be determined by the Designer.

- D. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
- E. Monitor dewatering systems continuously.
- F. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
  - 1. Space well points or wells at intervals required to provide sufficient dewatering.
  - 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- G. Before excavating below ground-water level, place system into operation to lower water to specified levels. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- H. Provide an adequate system to lower and control groundwater to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
  - 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
- I. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
  - 1. Maintain piezometric water level a minimum of 24 inches below surface of excavation.
- J. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.
- K. Provide standby equipment on site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense to the Owner.
  - 1. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.
- L. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

### 3.4 EXCAVATION SUPPORT AND PROTECTION

- A. Work shall not be started until all materials and equipment necessary for the construction are either on the site of the work or satisfactorily available for immediate use as required.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
  - 1. Shore, support and protect utilities encountered.
- C. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from the Owner's Representative and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- D. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces or installation of improvements is not impeded.
- E. The excavation support and protection systems shall be securely and satisfactorily braced to withstand all pressures to which it may be subjected and be sufficiently tight to minimize lowering of the groundwater level outside the excavation.
- F. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.
- G. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.
- H. Responsibility for the satisfactory construction and maintenance of the excavation support system, complete in place, shall rest with the Contractor. Any work done, including incidental construction, which is not acceptable for the intended purposed shall be either repaired or removed and reconstructed by the Contractor at his expense
- I. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.
  - 1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlaying construction and abandon remainder.
  - 2. Fill voids immediately with approved backfill compacted to density specified herein.
  - 3. Repair or replace, as approved by Owner's Representative, adjacent work damaged or displaced by the installation, performance, and removal of the excavation support and protection systems.

### 3.5 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
  - 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
    - a. 24 inches outside of concrete forms.
    - b. 6 inches outside of minimum required dimensions of concrete cast against grade.
    - c. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.
- B. Provide sheeting, shoring and bracing to complete and protect all excavated areas, are required for safety and compliance with OSHA. Cost for sheeting, shoring and bracing shall be included as a part of the contract price for completing the work and Owner shall make no separate payment for this work.
- C. Perform excavation work in accordance with all applicable Federal, State, and Local regulations regarding safe excavation work.
- D. Excavation in the area of existing utilities. Expose utilities by hand or other excavation methods that will prevent damage. Required excavation near electric, gas, water lines, and fiber-optic telecommunication lines shall be hand dug within 3 feet of the lines.
- E. Do not excavate to full depths when freezing temperatures may be expected unless subgrades are protected from freezing.

### 3.6 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Excavation for Underground Tanks, Manholes, Basins, Mechanical and/or Electrical Utility Structures, Drainage and Sewer Systems, Infiltration Systems, and Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

### 3.7 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

### 3.8 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
  1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  1. For pipes and conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
  2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
  3. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

### 3.9 SUBGRADE INSPECTION

- A. Notify the Owner's Representative when excavations have reached required subgrade.
- B. If the Owner's Representative, Geotechnical Engineer and/or the Designer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll granular subgrade below structures and pavements with heavy vibrating drum roller to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
  2. Proof-roll with approved equipment weighing not less than 15 tons.
  3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Designer, and replace with compacted backfill or fill as directed.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Geotechnical Engineer and/or the Designer, without additional compensation.
- E. Protect all subgrades from disturbance.
  1. Place Gravel Borrow or Crushed Stone wrapped in non-woven geotextile over clayey, silty or wet footing subgrades. Fill shall not be placed in standing water.
  2. Grade around prepared subgrade areas to direct stormwater runoff away from the work area.
  3. Protect subgrades from frost at all times during construction. Fill should not be placed over frozen soil.

3.10 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavations under site improvement construction or utility pipe as directed by Designer. Lean concrete fill, with 28-day compressive strength of 2500 psi may be used when approved by Designer.

3.11 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials (from off-site sources) and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
  - 2. Stockpile soil materials in a location, acceptable to the Owner's Representative, that will preclude having to relocate stockpiled soil materials that would otherwise delay or impact the Work.

3.12 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
  - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
  - 2. Surveying locations of underground utilities for Record Documents.
  - 3. Testing and inspecting underground utilities.
  - 4. Removing concrete formwork.
  - 5. Removing trash and debris.
  - 6. Removing temporary shoring and bracing, and sheeting.
  - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on previously placed and compacted fill and/or subgrades free of mud, frost, snow, or ice.
- C. Excavated on-site natural soils may be used as Ordinary Fill, provided the material can be placed and compacted as required herein and at the approval of the Designer.
- D. The Contractor shall not commence backfilling operations without approval of the Owner's Representative and/or the Designer.
- E. The Contractor shall maintain a dry and firm subgrade throughout construction. Dewatering shall be performed as needed at the Contractor's expense.
- F. The Contractor shall strip the existing subgrade of any vegetation, topsoil, organics, debris, or other unsuitable materials. The subgrade shall be proof compacted using a vibratory roller to treat any loose or disturbed areas and to provide a dense uniform surface.
- G. After the subgrade has been prepared, fill material shall be placed and built-up in successive layers until the required elevations are reached. No fill shall be placed on a frozen surface, nor shall snow, ice, or other frozen materials be included in fill. Wet materials containing moisture in excess of the amount necessary for satisfactory placement or compaction shall not be used.

- H. All fill shall be brought up in essentially level lifts and shall be placed in levels by standard methods. Layers of fill outside of utility trenches shall not exceed nine (9) inches in uncompacted thickness before compaction, unless otherwise specified, or as required for proper subgrade stabilization.
- I. Filling operations shall continue until the fill has been brought up to the finished slopes, lines, and grades making proper allowances for thickness of the overlying topsoil.
- J. The entire surface of the work shall be maintained free from ruts and in the condition that will permit construction equipment to travel over any section readily. The top surface of each layer shall be made level or slightly sloped toward the center of the filled area.
- K. Backfilling shall not be performed when weather conditions or the conditions of the materials are such that, in the opinion of the Geotechnical Engineer or the Designer, work cannot be performed satisfactorily.

### 3.13 BACKFILLING AGAINST STRUCTURES

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Backfilling against masonry or concrete shall not be done until permitted by the Owner's Representative. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads (including construction loads) to which they will be subjected, without distortion, cracking or other damage.
- C. As soon as practicable after the structures are structurally adequate and other necessary work has been satisfactorily completed and approved, special leakage tests of the structures shall be made by the Contractor, as required by the Owner's Representative. After the satisfactory completion of leakage tests and the satisfactory completion of any other required work in connection with the structures, the backfilling around the structures shall proceed using suitable and approved excavation material.
- D. The best of the backfill material shall be used for backfilling within 2-feet of the structure. Just prior to placing backfill, the areas shall be cleaned of all excess construction material and debris and the bottom of excavations shall be in a thoroughly compacted condition.
- E. Symmetrical backfill loading shall be maintained. Special care shall be taken to prevent any wedging action or eccentric loading upon or against the structures. During backfilling operations, care shall be exercised that the equipment used will not overload the structures in passing over and compacting these fills. Except as otherwise specified or directed, backfill shall be placed in layers not more than 12 inches in loose depth and each layer of backfill shall be compacted thoroughly and evenly using approved types of mechanical equipment. Each pass of the equipment shall cover the entire area of each layer of backfill.
- F. In compacting and other operations, the Contractor shall conduct his operations in a manner to prevent damage to structures due to passage of heavy equipment over, or adjacent to, structures, and any damage thereto shall be made good by the Contractor at no additional expense to the Owner.

### 3.14 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.

- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 - CAST-IN-PLACE CONCRETE.
- D. Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
- E. Place and compact initial backfill of subbase material free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.
  - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Backfill voids with satisfactory soil while installing and removing shoring and bracing.
- G. Backfill material shall be placed in maximum 6-inch lifts and mechanically compacted as specified herein.
- H. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- I. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
- J. Any trenches or excavations improperly backfilled or where settlement occurs shall be reopened, to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade and condition, at no additional expense to the Owner.
- K. During filling and backfilling operations, pipelines will be checked by the Owner's Representative to determine whether any displacement of the pipe has occurred. If the observation of the pipelines shows poor alignment, displaced pipe or any other defects they shall be remedied in a manner satisfactory to the Owner's Representative at no additional cost to the Owner.

### 3.15 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
- C. Place soil fills on subgrades free of mud, frost, snow, or ice.

### 3.16 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  2. Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.
  3. Fill material shall not be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until the moisture content and the density of the previously placed fill are as specified.

### 3.17 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:

| Area  | ASTM Density<br>Degree of Compaction |
|---|--------------------------------------|
| Pavement and walkway base course  | 95%                                  |
| Pavement and walkway subgrade   | 95%                                  |
| General fill below pavement and walkway subbase                                     | 95%                                  |
| Trench backfill - below pavements<br>- below landscaped areas<br>- below structures | 95%<br>92%<br>95%                    |
| All other areas   | 90%                                  |

1. Under structures and pavement, proof-compact existing subgrade. Compact each layer of backfill soil material at 95 percent of the soils' maximum dry density (per ASTM D 1557). Fill areas within the 1H:1V influence zone of foundations and retaining wall footings shall also be compacted to 95 percent of the soils' maximum dry density (per ASTM D 1557).
2. Under walkways, scarify and re-compact top 6 inches below subgrade to 95 percent of the soils' maximum dry density (per ASTM D 1557). Fill and base course material within 2 feet of the finished asphalt or concrete pavement grade shall be compacted to 95 percent of the soils' maximum dry density (per ASTM D 1557).



3. For utility trenches in paved areas, compact each layer of initial and final backfill soil material to at least 95 percent of the soils' maximum dry density (per ASTM D 1557).
  4. For utility trenches in lawn or unpaved areas, compact each layer of backfill soil material to at least 92 percent of the soils' maximum dry density (per ASTM D 1557).
  5. Under lawn or unpaved areas, scarify and re-compact top 6 inches below subgrade and compact each layer of backfill or fill soil material to at least 90 percent of the soils' maximum dry density (per ASTM D 1557).
- D. In confined areas, place Crushed Stone in maximum 6-inch lifts and compact each lift with at least 4 passes of a vibratory plate compactor to a firm and unyielding surface. In open areas, place Crushed Stone in maximum 12-inch lifts and compact each lift with at least four passes of a vibratory drum roller with a minimum static weight of 10,000 pounds. Crushed stone fill shall be wrapped on all sides with non-woven filter fabric.

### 3.18 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
1. Provide a smooth transition between adjacent existing grades and new grades.
  2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Lawn or Unpaved Areas: Plus or minus 1 inch.
  2. Walks: Plus or minus 1 inch.
  3. Pavements: Plus or minus 1/2 inch.

### 3.19 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified in Division 2 Section "Subdrainage."
- B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 1557.
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with 1 layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 1557.
  2. Place and compact impervious fill over drainage backfill in 6-inch-thick compacted layers to final subgrade.

### 3.20 SUBBASE AND BASE COURSES

- A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase and base course under pavements and walks as follows:
  - 1. Install separation geotextile fabric on prepared subgrade, where indicated on the Contract Drawings, according to manufacturer's written instructions, overlapping sides, and ends.
  - 2. Place base course material over subbase course under hot-mix asphalt pavement.
  - 3. Shape subbase and base course to required crown elevations and cross-slope grades.
  - 4. Place subbase and base course 6 inches or less in compacted thickness in a single layer.
  - 5. Place subbase and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 6. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
- C. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

### 3.21 DRAINAGE COURSE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under pavements, walkways and cast-in-place concrete slabs-on-grade as follows:
  - 1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides, and ends.
  - 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

### 3.22 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by the Owner for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.
- B. Cooperate with field quality control personnel.
- C. Additional inspections and retesting of materials which fail to comply with specified material and installation requirements shall be performed at Contractor's expense.
- D. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
  - 1. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.
  - 2. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained. Costs related to re-testing due to unacceptable quality of work and failures discovered by the testing shall be borne by the Contractor.
- G. Notify the Independent Testing Agency a minimum of 72 hours prior to start of earthwork operations, to comply with Code requirement that a registered design professional be present at all times during backfill to assure adequate compaction with no bridging effects. The services of the Testing Agency, Geotechnical Engineer, and the Designer shall include, but not be limited to, the following:
  - 1. Observation during excavation, backfilling, and compaction.
  - 2. Laboratory testing and analysis of fill materials specified or proposed for use as required.
  - 3. Observation of construction and performance of water content, gradation, and compactions tests at a frequency and at locations that he/she shall select. The results of these test will be submitted to the Owner's Representative so that the Contractor can take such action as is required to remedy any indicated deficiencies.
  - 4. Observation of proof-compaction of exposed subgrades. Proof-compaction may be waived if, in the opinion of the Geotechnical Engineer, disturbance will occur and cause loss of strength of underlying soil.
- H. The Contractor shall make provisions for allowing observations and testing of Contractor's Work by the Testing Agency and the Geotechnical Engineer, and the Designer. The presence of the Testing Agency, Geotechnical Engineering, and/or the Designer does not include supervision or direction of the actual work by the Contractor, his/her employees, or agents. Neither the presence of the Testing Agency, Geotechnical Engineer, and/or the Designer nor any observations and testing performed by those entities or any notice or failure to give notice, shall excuse the Contractor from defect discovered in his/her work.

### 3.23 PROTECTION

- A. No excavation will be permitted below a line drawn downwards at 2 horizontal to 1 vertical from the underside of the closest edge of any proposed in-place footing or utility at a higher elevation without providing adequate sheeting and bracing or underpinning to prevent loss of support of the footing or utility.
- B. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

- C. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  - 1. Scarify or remove and replace soil material to depth as directed by Designer; reshape and recompact.
- D. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.24 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Contractor shall remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

End of Section

Section 31 25 00  
EROSION AND SEDIMENTATION CONTROLS

**PART 1 - GENERAL**

**1.1 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

**1.2 DESCRIPTION OF WORK**

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:
1. Control measures to prevent all erosion, siltation, and sedimentation of wetlands, waterways, construction areas, adjacent areas and off-site areas.
  2. Control measures shall be accomplished adjacent to or in the following work areas:
    - a. Soil stockpiles and on-site storage and staging areas.
    - b. Cut and fill slopes and other stripped and graded areas.
    - c. Constructed and existing swales and ditches.
    - d. Retention ponds.
    - e. At edge of wetlands areas, if applicable, as shown on Drawings.
  3. The Contract Drawings indicate the minimum requirements for sedimentation and erosion control. The Contractor shall install all measures needed to control sediment and erosion as required by the Contractor and Sub-contractor's construction methods and operations, the weather conditions, and as directed by the Engineer.
  4. Additional means of protection shall be provided by the Contractor as required for continued or unforeseen erosion problems, at no additional cost to the Owner.
  5. Periodic maintenance of all sediment control structures shall be provided to ensure intended purpose is accomplished. Sediment control measures shall be in working condition at the end of each day.
  6. After any significant rainfall, sediment control structures shall be inspected for integrity. Any damaged device shall be corrected immediately.
- B. Alternates: Not Applicable.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
1. Section 31 10 00 – SITE CLEARING for protection of existing trees and other vegetation to remain.
  2. Section 31 20 00 – EARTH MOVING for soil materials, excavating, backfilling, and site grading and removal of site utilities.

### 1.3 SUBMITTALS

- A. Refer to SECTION 01 33 00 – SUBMITTALS for submittal provisions and procedures.
1. At least 20 days prior to the start of the project, the Contractor shall submit an Appendix by a qualified person to the Draft Stormwater Pollution Prevention Plan (SWPPP) indicating project phasing, Contractor operation areas, work areas, stockpile locations, construction staging/sequencing, and sedimentation and erosion control measures to be used. This Appendix shall become part of the SWPPP that is to be updated and maintained by the Contractor.
  2. As part of the Contract Closeout procedures, the Contractor is responsible for filing a Notice of Termination with the EPA once the project has been completed and is permanently stabilized. Stabilization is complete when all temporary stormwater and erosion controls have been removed, all permanent stormwater and erosion controls are in place and functional and all vegetated areas are at least 70% viable.
  3. The Contractor shall provide the manufacturer's literature, material specification, and installation instructions for sedimentation and erosion control materials and devices for approval. Do not order materials until approval of certifications or test results has been obtained. Delivered materials shall match the approved submittals.
  4. LEED Supporting Documentation: Submit LEED supporting documentation as outlined in Section 01 81 10 SUSTAINABLE DESIGN REQUIREMENTS for materials and products that have been extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site.

### 1.4 QUALITY ASSURANCE

- A. When applicable, comply with the requirements of Stormwater Pollution Prevention Plan prepared for the NPDES permit, which are incorporated herein by reference, and all other applicable requirements of governing authorities having jurisdiction. The specifications and drawings are not represented as being comprehensive, but rather convey the intent to provide complete slope protection and erosion control for both the project site and adjacent property.
1. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to a sediment and erosion control plan specific to the site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- B. Erosion control measures shall be established at the beginning of construction and maintained during the entire period of construction. On-site areas which are subject to severe erosion, and off-site areas which are especially vulnerable to damage from erosion and/or sedimentation, are to be identified and receive special attention.
- C. The Contractor shall install and maintain sedimentation control devices during construction to prevent the movement of sediment from the construction site to off-site areas, into adjacent water bodies via surface runoff or into underground drainage systems. Measures to prevent the movement of sediment off-site shall be installed, maintained, removed, and cleaned up at no additional cost to the Owner.
- D. All land-disturbing activities are to be planned and conducted to minimize the size of the area to be exposed at any one time, and the length of time of exposure.
- E. Surface water runoff originating upgrade of exposed areas should be controlled to reduce erosion and sediment loss during the period of exposure.

- F. When the increase in the peak rates and velocity of storm-water runoff resulting from a land-disturbing activity is sufficient to cause accelerated erosion of the receiving stream bed, provide measures to control both the velocity and rate of release so as to minimize accelerated erosion and increased sedimentation of the stream.
- G. All land-disturbing activities are to be planned and conducted so as to minimize off-site sedimentation damage.
- H. The Contractor is responsible for cleaning out and disposing of all sediment once the storage capacity of the sediment facility is reduced by one-half.
- I. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- J. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

#### 1.5 REFERENCE STANDARDS

- A. The following standards are applicable to the work of this Section to the extent referenced herein:
  - 1. "Massachusetts Erosion and Sedimentation Control Guidelines for Urban and Suburban Areas, A Guide for Planners, Designers and Municipal Officials", prepared by the Massachusetts Department of Environmental Protection, Bureau of Resource Protection, dated March 1997, reprinted May 2003.

#### 1.6 EXAMINATION OF SITE AND DOCUMENTS

- A. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of a lack of knowledge of existing conditions as indicated in the Contract Documents, or obvious from observation of the site.
- B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period and formed his own conclusions as to the full requirements of the work involved.

#### 1.7 PERMITS, CODES, AND REGULATIONS

- A. Comply with all rules, regulations, laws, and ordinances of the City and State, and all other authorities having jurisdiction over the project site. All labor, materials, equipment, and services necessary to make the work comply with such requirements shall be provided by the Contractor without additional cost to the Owner.
- B. Comply with all applicable regulations of the Commonwealth of Massachusetts Department of Environmental Protection (DEP) and the EPA.
- C. The Contractor shall comply with the requirements of the NPDES CGP for this project.

#### 1.8 STORM WATER POLLUTION PREVENTION PLAN

- A. A professional engineer has prepared a Draft Storm Water Pollution Prevention Plan (SWPPP). The Contractor shall locate the SWPPP and review its contents thoroughly. Upon the award of the Contract, the Contractor becomes responsible for implementing the

SWPPP and meeting the requirements and standards detailed within the SWPPP. The Contractor is also responsible for all record keeping associated with maintaining the SWPPP and for maintaining in good operating condition all SWPPP controls. The Contractor shall modify the SWPPP as necessary to reflect changes in project scope, schedule, or approach. All labor, materials, equipment, and services necessary to make the work comply with such requirements shall be provided by the Contractor without additional cost to the Owner.

- B. The Contractor shall fill out all pertinent information within the SWPPP.
- C. The Contractor shall locate the EPA "Notice of Intent for Storm Water Discharges Associated with CONSTRUCTION ACTIVITY Under a NPDES General Permit" (NOI) form in the SWPPP. The Contractor is responsible for signing and filing his copy of the NOI at least 14 calendar days prior to the start of any construction activity and placing a signed copy along with proof of mailing in the SWPPP.
- D. The Contractor is responsible for obtaining a copy of the Owner's filed copy of the NOI form and proof of mailing and placing it in the SWPPP.
- E. The Contractor is responsible for filling in the Contractor and Sub-Contractor information in the areas indicated within the SWPPP and for completing the Contractor's Certification portion of the SWPPP.
- F. The Contractor is responsible for maintaining the following records on site:
  - 1. Completed SWPPP as indicated in sections B, C, D, and E.
  - 2. Completed Inspection Reports
  - 3. Completed Maintenance Reports
  - 4. Construction Activity Reports
  - 5. Spill Records
  - 6. Other Materials relevant to the NOI Permit and SWPPP
  - 7. A copy of the Notice of Termination
- G. The Contractor is responsible for filing a Notice of Termination once the project has been completed and is permanently stabilized. Stabilization is complete when all temporary storm water and erosion controls have been removed, all permanent storm water and erosion controls are in place and functional and all vegetated areas are at least 70% viable.
- H. All labor, materials, equipment, and services necessary to make the work comply with the above requirements shall be provided by the Contractor without additional cost to the Owner.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Straw Bales: Wire or nylon bound bales of straw, oriented around sides, rather than over and under.
- B. Stakes: Stakes for bales shall be one of the following materials: Wood stakes of sound hardwood 2 by 2 inches in size or steel reinforcing bars of at least No. 4 size. Lengths shall be approximately three feet.
- C. Straw Wattles



1. Straw wattles shall consist of weed free rice straw inside biodegradable netting. Straw wattles shall measure at least nine (9) inches in diameter.
  2. Stakes for wattles shall be one of the following materials. Lengths shall be approximately two feet (2').
    - a. Wood stakes of sound hardwood, one inch by one inch (1" x 1") in size.
    - b. Steel reinforcing bars of at least No. 4 size.
- D. Siltation Fence
1. Fabricated or prefabricated unit consisting of the following filter fabric properties:

|  |         |            |
|--|---------|------------|
| a. Grab Tensile Strength (lbs)         | 124     | ASTM D4632 |
| b. Elongation at Failure (%)           | 15      | ASTM D4632 |
| c. Mullen Burst Strength (PSI)         | 280-300 | ASTM D3786 |
| d. Puncture Strength (lbs)             | 60-65   | ASTM D4833 |
| e. Water Flow Rate (gal/min/sf)        | 8-10    | ASTM D4491 |
| f. Apparent Opening Size (Sieve)       | 30      | ASTM D4751 |
| g. Ultraviolet Radiation Stability (%) | 70-80   | ASTM D4355 |
  2. Use only commercially available fabric that is certified in writing by the manufacturer for the purpose intended.
  3. Acceptable fabric materials include "Mirafi Envirofence" by Mirafi Construction Products, "Style 2130" by Amoco Fabrics Co., and "IVI 3617C Silt Fence" by Indian Valley Industries, Inc., or approved equal by the Engineer.
  4. Silt fence posts: Posts may be wood or metal. Wood post shall be a minimum 1¼ inch by 1¼ inch by 5 feet long hardwood stakes commonly used to support siltation fabric. Metal posts shall be a minimum of 1 inch wide and 5 feet long. Posts shall be spaced at a maximum distance of 8 feet on center.
  5. Provide suitable heavy nylon cord for securing abutting silt fence posts.
- E. Fencing: Steel posts shall be standard 6-foot-long metal stamped drive stakes commonly used to support snow fences. Fencing shall be new four-foot height wood lath snow fencing. Provide suitable steel staples or heavy nylon cord for securing filter cloth to support system.
- F. Crushed Stone: Crushed stone shall consist of durable crushed rock or durable crushed gravel stone, free from ice and snow, sand, clay, loam, or other deleterious or organic material. The crushed stone shall be uniformly blended and shall conform to the following requirements.

| Percent Passing by Weight |                  |                |
|---------------------------|------------------|----------------|
| Sieve Size                | 1 1/2-inch Stone | 3/4-inch Stone |
| 2-inch                    | 100              | ---            |
| 1 1/2-inch                | 95-100           | ---            |
| 1 1/4-inch                | ---              | ---            |
| 1-inch                    | 35-70            | 100            |
| 3/4-inch                  | 0-25             | 90-100         |
| 1/2-inch                  | ---              | 10-50          |
| 3/8-inch                  | ---              | 0-20           |

| Percent Passing by Weight |                  |                |
|---------------------------|------------------|----------------|
| Sieve Size                | 1 1/2-inch Stone | 3/4-inch Stone |
| No. 4                     | ---              | 0-5            |

- G. Protective Measures: As temporary coverings on ground areas subject to erosion, provide one of the following protective measures, and as directed by the Designer with concurrence of the Owner's Representative:
1. Hay or straw temporary mulch, 100 pounds per 1,000 square feet.
  2. Wood fiber cellulose temporary mulch, 35 pounds per 1,000 square feet.
  3. Tackafier for anchoring mulch or straw shall be a non-petroleum based liquid bonding agent specifically made for anchoring hay or straw.
  4. Provide natural (jute, wood excelsior) or man-made (glass fiber) covering with suitable staples or anchors to secure to ground surface. Note that wire staples and non-biodegradable coverings shall not be used for any area that will be mown turf.
  5. Temporary vegetative cover for graded areas shall be undamaged, air dry threshed straw or hay free of undesirable weed seed.
- H. Temporary Covers For Drainage Structures
1. Filter fabric for use as temporary covers for drainage structures shall be the same as noted above for siltation fence.
  2. Wire mesh for use at temporary drainage structure covers shall be 6" x 6", W2.9 welded wire mesh.
  3. Crushed stone shall be as specified herein before.
  4. Silt-Sac, Hydro-FloGard + Plus Catch Basin Insert, Ultra-DrainGuard Insert, or approved equal, may be used in lieu of hay bales and filter fabric at catch basins.

### PART 3 - EXECUTION

#### 3.1 GENERAL REQUIREMENTS

- A. The Contractor shall provide suitable and adequate means of sedimentation and erosion control during construction. Control measures shall prevent all erosion, siltation, and sedimentation of waterways, drainage systems, construction areas, adjacent areas and off-site areas. Work shall be accomplished on and/or adjacent to the following work areas:
1. Earthwork stockpiles and on-site storage and staging areas.
  2. Cut and fill slopes and other stripped and exposed graded areas.
  3. Constructed and existing swales and ditches.
  4. Unestablished lawns and seeded embankments.
- B. Means of protection as noted on the Contract Drawings indicate the minimum provisions necessary. Additional means of protection shall be provided by the Contractor as required for continued or unforeseen erosion problems, at no additional expense to the Owner.
- C. Periodic maintenance of all sediment control installations shall be provided to ensure intended purposes are accomplished. Sediment control measures shall be in working condition at the end of each day.
- D. After any significant rainfall, sediment control devices shall be inspected for integrity. Any damaged device shall be corrected immediately.

- E. The Contractor shall provide adequate means of control of runoff, as to not detrimentally impact downstream conditions during construction. The Contractor shall plan his operations so that permanent drainage mitigation systems such as detention/retention/infiltration basins and chambers are in place and properly functioning prior to connecting upland drainage flows to these systems. The Contractor shall plan his operations such that downstream drainage mitigation measures are in place and functioning before attempting to tie in upgradient drainage systems.
- F. In the event that the Contractor is unable to sequence the work so that construction of the permanent drainage mitigation systems precedes the upland work, then the Contractor shall submit a plan indicating his proposed methods of otherwise controlling runoff from the site.
- G. The "Massachusetts Erosion and Sedimentation Control Guidelines for Urban and Suburban Areas" should be consulted as a guide for the selection and installation of Best Management Practices to suit the conditions encountered.

### 3.2 STRAW BALE BARRIERS

- A. Excavation shall be to the width of the bale and the length of the proposed barrier to a minimum depth of 4 inches.
- B. Bales shall be placed in a single row, lengthwise on proposed line, with ends of adjacent bales tightly abutting one another. In swales and ditches, the barrier shall extend to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale.
- C. Staking shall be accomplished to securely anchor bales by driving at least two stakes or rebars through each bale to a minimum depth of 18 inches.
- D. The gaps between bales shall be filled by wedging straw in the gaps to prevent water from escaping between the bales.
- E. The excavated soil shall be backfilled against the barrier. Backfill shall conform to ground level on the downhill side and shall be built up to 4 inches on the uphill side. Loose straw shall then be scattered over the area immediately uphill from a straw barrier.
- F. Inspection shall be frequent and repair or replacement shall be made promptly as needed.
- G. Bales shall be removed when they have served their usefulness so as not to block or impede stormwater flows or drainage.

### 3.3 STRAW WATTLE BARRIERS

- A. Install straw wattles in locations as shown on Contract Drawings and as directed.
  - 1. Wattles shall be placed in a row with ends overlapping a minimum of two (2) feet.
  - 2. Each wattle shall be embedded in the soil a minimum of two (2) and a maximum of six (6) inches.
  - 3. Wattles shall be securely anchored in place by stakes or rebars driven through the wattles and a minimum twelve (12) inches into the soil. Stakes shall be placed four (4) feet on center.
- B. Inspection shall be frequent and repair or replacement shall be made as needed.

- C. Wattles shall be removed when they have served their usefulness so as not to block or impede stormwater flows or drainage.

#### 3.4 STABILIZED CONSTRUCTION ENTRANCE AND STONE BERMS

- A. Stone size: Use ASTM designation C-33, size No. 2 (1-1/2" to 2-1/2"). Use crushed stone.
- B. Length: As effective, but not less than 50 feet.
- C. Thickness: Not less than eight inches.
- D. Width: Not less than full width of all points on ingress or egress, but not less than 25 feet.
- E. Washing: When necessary, wheels shall be cleaned to remove sediment prior to entrance onto public right-of-way. When washing is required, it shall be done on an area stabilized with crushed stone which drains into an approved sediment trap or sediment basin. All sediment shall be prevented from entering any storm drain, ditch, or watercourse through the use of sand-bags, gravel boards or other approved methods.
- F. Maintenance: The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment. All sediment spoiled, dropped, washed or tracked onto public rights-of-way must be removed immediately.
- G. Place crushed stone berms in locations required and as directed. Berms shall have side slopes of 1:3 or less.
- H. Inspect stone berms periodically and replace and/or regrade crushed stone as required.

#### 3.5 SILT FENCING

- A. Excavate a 6-inch trench along the upstream side of the desired fence location.
- B. Drive fence posts a minimum of 1'-6" into the ground. Install fence, well-staked at maximum eight-foot intervals in locations as shown on Drawings. Secure fabric to fence and bury fabric end within the six-inch deep trench cut.
- C. Lay lower 12 inches of silt fence into the trench, 6 inches deep and 6 inches wide. Backfill trench and compact.
- D. Overlap joints in fabric at post to prevent leakage of silt at seam.
- E. Inspect siltation fence after major storm events and periodically and remove accumulated sediment and debris. If a breach or failure of the siltation fence occurs, the fence shall immediately be restored.

#### 3.6 EROSION CONTROL GRASSING

- A. Grassing shall be applied according to State of Massachusetts Highway Department Standard Specifications.

#### 3.7 INLET PROTECTION

- A. Install silt fence or straw bales around inlet as specified herein.

- B. Install temporary covers at drainage structure locations that may be subject to erosion infiltration and as directed by the Engineer.
- C. Inspect drainage structures periodically. Remove sediment accumulation and regrade or replace materials as required.

### 3.8 DUST CONTROL

- A. Throughout the construction period the Contractor shall carry on an active program for the control of fugitive dust within all site construction zones, or areas disturbed as a result of construction. Control methods shall include the following: Apply calcium chloride at a uniform rate of one and one-half (1 ½) pounds per square yard in areas subject to blowing. For emergency control of dust apply water to affected areas. The source of supply and the method of application for water are the responsibility of the contractor.
- B. The frequency and methods of application for fugitive dust control shall be as directed by the Designer with concurrence by the Owner's Representative.

### 3.9 TEMPORARY PROTECTIVE COVERINGS

- A. Place temporary soil coverings to control erosion and sedimentation on all disturbed or graded areas as required by the construction methods employed and as directed by the Engineer. Erosion control matting shall be installed in all areas seeded or hydroseeded with slopes of one vertical foot to three-foot horizontal, or steeper, immediately after such areas have been seeded and a hay mulch applied as follows:
  - 1. The area to receive matting shall have been recently seeded and shall have a smooth surface free from stones, clods or depressions.
  - 2. Roll out of the matting perpendicular to the slope, do not stretch the fabric. In drainage swales, center the fabric along the flow line. Install the matting in a check slot at the top and bottom of the slope and at the edges of the area to be covered. Check slots shall be six inches deep and six inches wide. Fabric shall extend down one wall of the check slot and across the full width of the base. Overlap edges of matting rolls four (4) inches minimum and overlap the ends eighteen (18) inches minimum.
  - 3. Install staples in check slots, edges, center, and ends of rolls by driving specified steel staples two feet on center over the entire area to be covered except at check slots and ends of rolls, where staples shall be placed six inches on center. All staples shall be driven below finished grade.
  - 4. Fill check slots with loam and tamp firmly.
  - 5. Reseed check slots and all disturbed areas per Specifications.
  - 6. Following matting installation, roll the entire area with a smooth drum roller weighing between fifty and seventy-five (50-75) pounds per linear foot of roller. The finished installation of matting shall be firmly in contact with the seeded area and provide a smooth, finished appearance free from lumps or depressions.
- B. Install erosion control matting as a temporary ground cover in all disturbed or graded areas subject to erosion and as directed by the Engineer. The temporary ground cover shall protect the site from erosion until a full permanent lawn can be installed. Install and anchor in place temporary erosion control matting in accordance with manufacturer's printed instructions or as directed by the Engineer and remove all temporary erosion control matting prior to installation of a permanent lawn.
- C. Inspect protective coverings periodically and reset or replace materials as required.

3.10 TEMPORARY PROTECTIVE COVERINGS (AFTER GROWING SEASON)

- A. Place temporary covering for erosion and sedimentation control on all areas that have been graded and left exposed after October 30. Contractor shall have the choice to use either or both of the methods described herein.
- B. Hay or straw shall be anchored in place by one of the following methods and as approved by the Designer with concurrence by the Owner's Representative: Mechanical "crimping" with a tractor-drawn device specifically devised to cut mulch into top two inches of soil surface or application of non-petroleum based liquid tackifier, applied at a rate and in accordance with manufacturer's instructions for specific mulch material utilized.
- C. Placement of mesh or blanket matting and anchoring in place shall be in accordance with manufacturer's printed instructions.
- D. Inspect protective coverings periodically and reset or replace materials as required.

3.11 REMOVAL AND FINAL CLEANUP

- A. Once the site has been fully stabilized against erosion, and with the approval of the Owner's Representative remove sediment control devices and all accumulated silt. Dispose of silt and waste materials offsite. Regrade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated.

End of Section

Section 32 12 16  
ASPHALT PAVING

**PART 1-GENERAL**

**1.1 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

**1.2 DESCRIPTION OF WORK**

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:
  - 1. Hot-mix asphalt paving, including walkways, ramps, and curbs.
  - 2. Hot-mix asphalt patching.
  - 3. Pavement-marking paint.
  - 4. Setting of Curb.
- B. Alternates: Not Applicable.
- C. Items to Be Installed Only: Not Applicable.
- D. Items to Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
  - 1. Section 31 20 00 - EARTH MOVING for aggregate subbase and base courses and for aggregate pavement shoulders.

**1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
  - 1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities. Submit shop drawings for curbing items.
- C. Material Certificates: For each paving material, from manufacturer.

**1.4 REFERENCE STANDARDS**

- A. The following standards are applicable to the work of this Section to the extent referenced herein:
  - 1. Commonwealth of Massachusetts, Massachusetts Highway Department (MHD), Standard Specifications for Highways and Bridges, latest English Edition with

amendments. All references to method of measurement, basis of payment and payment items in the Standard Specifications are hereby deleted. References made to particular sections or paragraphs in the Standard Specifications shall include all related articles mentioned herein.

2. ASTM: American Society for Testing and Materials
3. AASHTO: American Association of State Highway and Transportation Officials
4. ACI: American Concrete Institute
5. MUTCD: Manual on Uniform Traffic Control Devices

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by the Massachusetts Highway Department (MHD).
- B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the Massachusetts Highway Department (MHD) for hot mix asphalt paving work.
  1. Comply with requirements of the Massachusetts Highway Department (MHD) Standard Specifications for Highways and Bridges, including supplemental specifications and special provisions.
  2. Comply with requirements of the Americans with Disabilities Act (ADA) and the Massachusetts Architectural Access Board (MAAB). If these requirements cannot be met with the grades and slopes indicated on the plans, notify the Designer immediately.
  3. Comply with requirements of the local authority having jurisdiction concerning the location and construction of accessible curb cuts.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.
  1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
    - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
    - b. Review condition of subgrade and preparatory work.
    - c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
    - d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.



## 1.7 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
  - 1. Tack Coat: Minimum surface temperature of 60 deg F.
  - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
  - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- C. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F.

## 1.8 EXAMINATION OF SITE AND DOCUMENTS

- A. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of a lack of knowledge of existing conditions as indicated in the Construction Documents, or obvious from observation of the site.
- B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period and formed his own conclusions as to the full requirements of the work involved.

## 1.9 ADA AND MAAB COMPLIANCE

- A. Comply with American with Disabilities Act (ADA) and the requirements of the Massachusetts Architectural Access Board (MAAB).
  - 1. Slopes: Walkways, as defined by Section 22.1 of 521 CMR, shall be graded to a maximum of 4.5%. The cross-pitch (perpendicular to travel) for walkways and paths shall be constructed at 1.5%. The slopes of ramps and side slopes on handicap curb cuts as defined by Section 21.1 of 521 CMR shall be constructed at 7% maximum. Ramps, as defined in Section 24.1 of 521 CMR, shall be constructed to a maximum slope of 7%.
  - 2. The Contractor is to assume that sidewalk grades will be verified and checked with a 2-foot long electronic 'smart level'.
  - 3. A 5'-0" minimum level, 1.5% pitch, area shall be provided at entrances to buildings. Puddling or ponding of water at the entrances will not be accepted.
  - 4. Handicap parking spaces and access aisles shall be graded level with the slope not to exceed 1.8% in any direction.
  - 5. The requirements specified hereinabove shall supersede the grades indicated on the Drawings. If these requirements cannot be met with the grades indicated on the Drawings, the Designer shall be notified immediately for direction.

## PART 2-PRODUCTS

### 2.1 AGGREGATES

- A. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- B. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
- C. Mineral Filler: ASTM D 242 or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.
- D. Reclaimed Asphalt Pavement (RAP): Provide material obtained from the highways or streets by crushing, milling, or planing existing hot mix asphalt pavements.
  - 1. The proportion of RAP to virgin aggregate for base course mixtures and intermediate course mixtures shall be limited to a maximum of 40% for drum mix plants and 20% for modified batch plants. The maximum amount of RAP for surface course mixtures shall be 10%.

### E. RECLAIMED BASE COURSE

- 1. The work under this item shall consist of scarifying and pulverizing in place the existing asphalt pavement and underlying material, mixing and blending the material, and spreading and compacting the mixture to the lines and grades shown on the Contract Drawings.
- 2. Equipment such as rear-mounted ripper crushers and cold planing/milling equipment will not be permitted to perform the work under this item.
- 3. Prior to scarifying and pulverizing the pavement, the Contractor shall locate, protect, or remove all drainage and utility structure castings. All lowered structures shall be protected and covered by a steel plate and all watergates shall be covered as well to prevent any materials from falling into the bottom sections. All materials that fall into any structures as a result of the Contractor's operations shall be removed by the Contractor at no additional cost.
- 4. The existing full bituminous pavement structure and underlying base materials shall be simultaneously crushed, pulverized, and blended into a homogenous material to create the following gradation:

| <u>Sieve Designation</u> | <u>Percent Passing</u> |
|--------------------------|------------------------|
| 2-inch                   | 100                    |
| 1½-inch                  | 70-100                 |
| ½-inch                   | 50-85                  |
| No. 4                    | 30-60                  |
| No. 50                   | 8-28                   |
| No. 200                  | 0-10                   |

- 5. The construction operation shall be performed in such a manner as to allow for continuous vehicular access as required by the project schedule. Emergency vehicular access shall be maintained at all times.

## 2.2 ASPHALT MATERIALS

- A. Asphalt Binder, Performance Graded: AASHTO M320 or AASHTO MP 1a, performance grade as required by MHD Specifications.
- B. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

## 2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- B. Pavement-Marking Paint: Fast Drying White Water-borne Traffic Paint and Fast Drying Yellow Water-borne Traffic Paint as specified in the "Standard Specifications" under Sections M7.01.23 and M7.01.24, respectively.
  - 1. Color: As indicated
- C. Detectable Warning Panels shall have dome geometry in accordance with ADA Regulations for Detectable Warning on Curb Ramps. They shall be raised truncated domes with a nominal diameter of 0.9-inches, a nominal height of 0.2-inches, and a center-to-center spacing of 1.6 inches to 2.4-inches. Panels shall be 24-inches deep in the direction of travel and the full width of the proposed ramp. The panel shall be a homogeneous glass and carbon reinforced composite, which is colorfast, and UV stable. The panel is to be colored throughout and not a painted coating. The color is to be contrasting to the background sidewalk color. The panels shall have a compressive strength in excess of 10,000 psi, flexural strength in excess of 3,000 psi and a slip resistance in excess of 0.8 wet or dry.
- D. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
  - 1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.

## 2.4 ASPHALT MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by MHD Specifications and designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types".

## 2.5 ASPHALT CURB

- A. Bituminous concrete curb shall conform to Section 501.64 of the Standard Specifications for Class 1 Bituminous Concrete Curb, Type-2 and Type-3 and shall meet the dimensions as shown on the Contract Drawings.
- B. Bituminous concrete shall meet the requirements of Dense Mix as specified in the Standard Specifications under Section M3.12.00.

## 2.6 GRANITE CURB AND EDGING

- A. Granite curb and edging shall be light gray in color, free of seams and other imperfections, which would affect its structural integrity. The front face of the stone shall be at right angles to the plane of the top and the ends and shall have a smooth surface. The ends of the stones

shall be square with the planes of the top and front face to provide flush joints. Top surface shall be sawn cut with a split front face.

- B. Granite curb shall have a top width of six-inches and a depth of 17 to 19-inches and a minimum length of 6-feet. Granite edging shall have a thickness of five to six inches and a depth of 11 to 13-inches with a minimum length of 4-feet.
- C. Granite curb to be set on a radius of 100-feet or less shall be cut to the required radius. Granite edging set on a radius of 160-feet or less shall be supplied in lengths shorter than 6-feet but no less than 1-foot to provide a smooth appearance.
- D. The ends of all transition curb shall be cut with a power driven saw to provide a flush vertical joint with adjacent curbing

## 2.7 PRECAST CONCRETE CURB

- A. Precast concrete curb units shall consist of castings conforming to a 6-inch by 18-inch nominal profile size with a 7-inch base dimension. Straight curb shall be cast in minimum lengths of 6 feet. Straight and curved curb may be cast in lengths of not less than 3 feet for closure sections only. Curb on a radius of 100 feet or less shall be cast in radius forms to the correct radius. The Contractor shall supply special cast corner sections for all corners where curb runs change direction. All curbs shall have a ½ inch chamfered edge on both ends and front sides as detailed. The front top edge shall have a ¾ inch radius and the back top edge shall have a ¼-inch radius.
- B. Curb shall be made of Portland cement types I or III, conforming to ASTM C150. Admixtures shall meet ASTM C233. Forms shall be made of metal to tight, rigid construction with true surfaces. Wood forms are not acceptable except for cast-in-place closure sections.
- C. Concrete mix for curb shall be made of a maximum ¾-inch aggregate with a design strength of 5,000 psi at 28 days. An air-entraining agent shall be added to the mixer in accurately proportioned amounts to give air content to the concrete of not less than 5 percent and not more than 7 percent by volume. A high range water-reducing agent (superplasticizer) shall be added to the mixer in accurately proportioned amounts to meet design strength requirements and maintain a smooth, dense surface on the curb.
- D. Surface Treatment: Upon removal from the forms, the surfaces of the curb shall have all surfaces rubbed with a carborundum stone to fully remove any rough or imperfections in the cast finish. All curbing sections shall have a uniform color and finish appearance and shall be approved by the Architect. An approved sample shall be standard for the entire job.
- E. Curb shall be reinforced with bars conforming to ASTM A615.

## 2.8 SEALCOAT

- A. Asphalt emulsion sealcoat shall conform to the requirements of the Asphalt Institute for seal coating. Non-volatile solids shall be 40-70%. No additional water shall be added. The emulsion shall be produced using a colloid mill to ensure homogeneity and appropriate size of the particles in suspension.
- B. Sand shall be washed and graded silica sand, or crushed, washed, and graded slag, free of all contaminants, and conforming within a 40-70 mesh gradation range. The addition of sand shall target 3 lbs.-4 lbs. per gallon.

- C. Sand shall be slowly added into the emulsion with the mixer engaged during the addition of the sand to ensure uniform dispersion and to prevent overloading of the mixing device. No additional water shall be added.
- D. Slow mixing shall be continuous from the time all materials are placed into the mixer until the pavement sealer mix is applied to the pavement by the application equipment. During the entire mixing process, no breaking, segregating, or hardening of the emulsion, and no balling or lumping of the aggregate shall be permitted.
- E. The Contractor shall submit a certified analysis of the proposed asphalt bulk emulsion, non-volatiles content, and ash content.

## 2.9 SEALANT FOR CRACK FILLING/SEALING

- A. The sealant material shall be a hot pour elastomeric type conforming to the requirements of ASTM D 6690 Type II, together with the following modifications:

|  |               |
|--|---------------|
| Cone Penetration at 77°F (25°C), 150 g, 5 sec.                           | 50 – 90       |
| Flow at 140°F (60°C), 75-degree angle, 5 hrs.                            | 5 mm          |
| Bond at 0°F (-18°C), 100 percent extension, 1/2" (12.7mm) thick specimen | Pass 5 cycles |
| Resilience at 77°F (25°C)  | 25 - 60       |

- B. Storage, heating instructions, and cautions shall be printed on each box of sealant. The sealant must be able to be reheated to application temperature at least once after the initial heat up without degradation of sealant specifications. Sealant shall have an application life at application temperature of approximately 12 to 15 hours.
- C. Prior to the use of the sealant material, the contractor shall submit to the Engineer, the appropriate material certification or laboratory test indicating that the material meets specification requirements.

## PART 3-EXECUTION

### 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

### 3.2 COLD MILLING

- A. This work consists of removing bituminous or cement concrete pavements by use of a cold planer in areas designed on the Contract Drawings. The cold planer must be equipped with an elevating device capable of loading planed material directly into dump trucks while operative. It shall have all the necessary safety devices, such as reflectors, headlights, taillights, flashing lights, and backup signals so as to operate safely in traffic both day and/or night.

- B. The cold planer shall be designed and built for planing flexible pavements and possess the ability to plane cement concrete patches when encountered in bituminous pavement. It shall be self-propelled and have the means for planing without tearing or gouging the underlying surface. Variable lacing patterns shall be provided to permit a rough grooved or smooth surface as directed.
- C. The cold planer shall be able to make up to a 3-inch cut or any specified lesser depth may be required in one pass. The minimum width of pavement planed in each pass shall be 6 feet, except in areas to be trimmed and edged. The machine shall be adjustable as to crown and depth and meet the standards set by the Air Quality Act for noise and air pollution.
- D. The planed surface shall conform to the grade and cross-slope required. The surface shall not be torn, gouged, shoved, broken, or excessively grooved. It shall be free of imperfections in workmanship that prevent resurfacing after this operation. Surface texture shall be as specified by the Engineer and excess material shall be removed so the surface is acceptable to traffic if required.
- E. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

### 3.3 PATCHING

- A. Existing Hot-Mix Asphalt Pavement: Saw-cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Existing Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
  - 1. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a minimum rate of 0.05 to 0.15 gal./sq. yd.
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

### 3.4 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

### 3.5 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross-section, and thickness when compacted.
  - 1. Spread mix at minimum temperature of 250 deg F.
  - 2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### 3.6 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
  - 1. Clean contact surfaces and apply tack coat to joints.
  - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
  - 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
  - 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

### 3.7 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
  - 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: ASTM D 2041, per MHD Specifications.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### 3.8 ASPHALT CURBS

- A. Construct hot-mix asphalt curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust. Spread mix at minimum temperature of 250 deg F.
  1. Asphalt Mix: Same as pavement surface-course mix.
- B. Place hot-mix asphalt to curb cross section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.

### 3.9 CURBING AND EDGING

- A. Construct curbing and edging of the type and at the locations shown on the Contract Drawings.
- B. Construct curbing and edging in accordance with the details shown on the Contract Drawings.
  1. The foundation for curb and edging shall consist of gravel spread upon the subgrade and after being thoroughly compacted shall be 6 inches in depth. The bottom of the curbstones shall be fully seated and supported on the compacted subgrade.
  2. The joints between curbstones shall be carefully filled with cement mortar and neatly pointed on all exposed surfaces.
  3. After pointing, the curbstones shall be cleaned of all excess mortar.
- C. After curbing and edging is in place at the line and grade shown on the Contract Drawings, backfill and compact equally on both sides with subbase course material, as specified in Section 312000 – EARTH MOVING. Compaction shall be by vibratory, hand-operated equipment, and shall achieve the same density as specified for subbase course in Section 312000 – EARTH MOVING.

### 3.10 INSTALLATION TOLERANCES

- A. Accessibility: Comply with requirements of Massachusetts Architectural Access Board and ADAAG requirements. Remove and replace paving that does not meet required tolerances when measured with a 2-foot straight edge.
- B. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:



1. Base Course: Plus or minus 1/2 inch.
  2. Surface Course: Plus 1/4 inch, no minus.
- C. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within MHD Specification tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas.

### 3.11 SEALCOATING

- A. Contractor shall provide all tools and equipment necessary to perform the work, including but not limited to brushes, hand squeegees, pumps and hose equipment, storage tanks, mixing tanks, water distributors, power sweepers, blowers, barricades, and applicator equipment.
1. Spray equipment used on the job shall have full sweep mechanical agitators incorporated in their construction to assure homogeneous mixing of the asphalt emulsion sealer, sand, and water (if required). The pumping system must be adequate to apply a uniform coating at the specified rates of application. Equipment requiring pressurization of the mixing tank for distribution will not be used.
  2. Motorized squeegee application equipment used on the job will have two or more devices such as squeegees and/or drag broom assemblies to assure even distribution of the asphalt emulsion sealer. A full sweep mechanical agitator will be incorporated into the construction of the applicator to assure homogeneous mixing of the emulsion.
  3. Mixing or agitating equipment may be either portable powered or a tank-type power mixer. In any case, mixers shall be of sufficient capacity to assure homogeneous mixing of the emulsion and to maintain complete suspension of mineral aggregate until the emulsion is applied to the pavement. All storage tanks shall be equipped with mechanical agitators sufficient to keep the asphalt emulsion homogeneous during storage.
- B. The contractor shall coordinate their activities with each other to ensure the availability of the work area to avoid delaying the execution of the project, to maintain traffic flow, and to minimize activities that might be detrimental to the work in progress, other customer or construction traffic.
- C. Surface to receive sealcoat must be free of all foreign material and dry immediately prior to application of sealer.
- D. Remove oil and grease spots that have not permanently damaged or softened the pavement by scrubbing with a detergent and flushing with water until a water-break-free surface is obtained. Oil and grease spots with deeper penetration will be treated by burning with hand-held propane torch, and then coating the spot with an approved oil spot primer compatible with the sealer. If the oil spot is so severe as to cause permanent deterioration of the pavement, or if the pavement has failed due to other causes, the pavement shall be removed to the full depth of the damage and replaced with new asphalt pavement.
- E. Existing pavement markings shall be blackened with black epoxy or black acrylic coatings. Excessive buildup of old lines should be abraded before any prime coats of emulsion are applied.
- F. Cracks in excess of 1/4", but less than one inch in width must be crack filled prior to application.
- G. Pavement shall be cleaned by air blowing, vacuum, or mechanical sweeper.

- H. Asphalt sealcoat shall not be placed on new asphalt concrete until a 30 day cure time has occurred.
- I. Application of asphalt sealcoat shall be by mechanical means using rubber-faced squeegees, brooms, distributor bar/wand in combination. Two (2) coat application.
  - 1. The coating shall be applied uniformly over the entire pavement surface and free of voids and pinholes. Subsequent coats shall be applied only after the previous coat is dried, preferably after 24 hours of cure time, but after no less than 4 hours under ideal conditions. Ideal conditions are temperatures in excess of 70° F, sunshine, and less than 60% relative humidity. Marginal conditions can require curing times greater than 24 hours. Subsequent coats shall be applied at right angles to the previous coat, if possible.
  - 2. First coat mechanical squeegee self-propelled is recommended, but wand application is allowed. Second coat by spray wand to lock down exposed aggregate and to return the parking lot to a proper aesthetic appearance free of streaks and marks.
  - 3. Application rate for each coat shall be 13 to 17 gallons per 1,000 SF as recommended by the Asphalt Sealcoat Manufacturers Association. Alternative application rates may be allowed if approved by Engineer.
  - 4. Sealer shall not be applied unless the temperature is a minimum 50° F and rising and pavement temperature is 60° F and rising. Work shall be completed so that there is a minimum of three hours of sunlight remaining after completing the day's work. Sealer shall not be applied under rainy or wet conditions such as an overcast sky with high humidity. UNDER NO CIRCUMSTANCES shall work, be performed under cold and/or wet conditions, nor shall emulsion be used that has been subjected to freezing weather.
  - 5. In hot weather application 80°, F or higher (pavement temperatures are in excess of 120° F) fog spraying of pavement with potable water shall be used to achieve better bond and even spreading of material. Properly applied fog spray shall dampen pavement without leaving puddles. Seal coat application shall not commence until it is determined there is no standing water to prevent even application and drying of the asphalt sealer.
  - 6. Striping for parking and traffic flow should be done only after the sealcoat has dried completely to accept approved traffic paint
- J. PAVEMENT CLEANING AND PROTECTION
  - 1. The pavement surface and all work areas shall be left in a clean condition.
  - 2. Vehicular traffic shall not be permitted on the pavement that has been sealed during the dry period. The contractor shall supply all temporary traffic control devices (barricades, cones, signing, etc.) to protect the sealant. Any damage to uncured sealant shall be repaired at the contractor's expense.

### 3.12 CRACK FILLING/SEALING

- A. Contractor shall provide all tools and equipment necessary to perform the work, including but not limited to Routers (Vertical-Spindle and/or Rotary-Impact), Hot Compressed Air Heat Lance, Hot-applied Sealant Applicators, Wire-brushes, and compressed air equipment.
  - 1. Router: The routing machine shall be an impact router equipped with carbide-tipped vertical-sided bits. It shall be portable and capable of routing existing asphalt surfaces along and adjacent to the crack and joint. The unit shall be capable of following random cracks and be designed to adjust the cutting widths. The unit shall be equipped with a cutter head clutch and shall have an adjustable depth control.

2. Hot Compressed-Air Lance (HCA): The HCA shall be capable of producing air temperature up to 2500°F and constructed of suitable hardware. It shall be provided with separate valves to control propane, burner air, and lance air. The fuel and burner air shall be mixed only at the point of combustion before leaving the burner tube. A separate air lance tube shall pass inside the burner chamber and be orificed to a maximum 1/4". At the fuel source, a high-pressure regulator to control fuel pressure from 5 PSI to 30 PSI and to prevent flashback shall be used. Burner BTU should range from 20,000 to 500,000 BTU. A wheel kit constructed to keep the unit at the proper height and angle from the pavement should be used. No external flame shall be allowed to touch the pavement.
3. Hot-Applied Sealant Applicator (melter): The melter applicator unit shall be a self-contained double boiler device with the transmittal of heat through a heat transfer oil. It must be equipped with an onboard automatic heat-controlling device to permit the attainment of a predetermined temperature, then maintain that temperature as long as required. The unit shall have a means to vigorously and continuously agitate the sealant. The sealant shall be transferred from the unit to the crack by means of a direct-connected feed hose and wand. The equipment should be designed to allow the sealant to be circulated back into the unit when sealing is not being performed or equipped with a temperature controlled heated hose and wand that does not required circulation. The sealant should not be heated to a temperature in excess of that specified by the manufacturer.

#### B. CRACK PREPARATION PROCEDURES

1. Hairline cracks (less than 1/4") require no preparation
2. Small to Medium Cracks (1/4" to 1-1/4"): All open cracks and joints from 1/4" to 1-1/4" shall be routed to remove at least 1/8" from each sidewall. This will result in a minimum reservoir width of 1/2" to a maximum reservoir width of 1-1/2". Widening the cracks 1/8" from each sidewall will reduce the potential for raveling of the pavement along the edges of cracks and will provide a sealant reservoir that has vertical faces. The depth of the routing shall be approximately a one to one ratio (width to depth), with a minimum depth of approximately 3/4". Backer rods can be used for deeper cracks (over 1-1/4" deep) to minimize material loss and still provide an acceptable seal.
3. Large Cracks (Greater than 1-1/4"). Cracks wider than 1-1/4" shall be prepared in the same manner as potholes. A saw shall be used to cut away damaged pavement to provide a vertical faces. The area should then be cleaned and filled with hot mix asphalt instead of sealed.
4. No sealant shall be installed until all cracks and joints have be cleaned free of all deleterious materials, including any dust, old sealant, incompressible material, and organic material, and are sufficiently dry. Following the initial routing and cleaning operation, all cracks and joints shall be HCA lanced within 10 minutes of application of the sealant. Equipment for the two operations should be kept in a compact configuration such that not more than 50 feet separates equipment required by the two operations. Extreme care shall be used to ensure the crack sidewalls do not become overheated and burned.
5. When vegetation exists in the cracks and joints, it shall be removed and those cracks and joints shall be treated with a herbicide that sterilizes the soil.

#### C. APPLICATION OF CRACK AND JOINT SEALANT

1. The sealant shall be applied in the crack or joint reservoir uniformly from the bottom to the top and shall be filled without formation of entrapped air or voids.
2. Pouring pots or gravity-fed sealant applicators shall not be used for sealing cracks and joints.

3. Joints and cracks shall be filled flush with the surface and any overfill shall be squeegeed so that the overband cap does not exceed 1/16" above the surface and the width does not exceed 2" beyond the crack edges.
4. All overbanding shall be kept to a minimum. After the sealant has cooled, settling shall not exceed 3/8" below the surface.

D. PAVEMENT CLEANING AND PROTECTION

1. The pavement surface and all work areas shall be left in a clean condition.
2. Vehicular traffic shall not be permitted on the pavement in the areas of the treated cracks and joints during the curing period. The contractor shall supply all temporary traffic control devices (barricades, cones, signing, etc.) to protect the sealant. Any damage to uncured sealant shall be repaired at the contractor's expense.

3.13 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Designer.
- B. Allow paving to age for a minimum of 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.14 WHEEL STOPS

- A. Securely attach wheel stops to pavement with not less than two galvanized-steel dowels embedded at one-quarter to one-third points. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.15 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by Massachusetts State College Building Authority for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.
- B. Test the plane of the finished surfaces of base, binder, and surface courses with a 16-foot straightedge, except use a 10-foot straightedge on vertical courses and on the top course of resurfaced streets which contain manhole covers, valve boxes, and the like.
- C. Carefully apply the straightedge immediately after the first compaction by rolling, and from then on as may be necessary until and after the final compaction of the material in place. Hold the straightedge in successive positions parallel to the road centerline and in contact with the road surface; check the entire area from one side of the pavement to the other.
- D. Correct irregularities which vary 3/8 inch from a true finished surface in base and binder courses, and 1/4 inch in top courses.
- E. Irregularities which may develop before the completion of rolling and while the material is still workable may be remedied by loosening the surface mixture and removing or adding material as necessary. Should any unsatisfactory irregularities or defects remain after final

compaction, the defective work shall be corrected by removing and replacing with new material to form a true and even surface.

3.16 OPENING TO TRAFFIC

- A. No vehicular traffic or loads shall be permitted on the newly completed pavement until all of the following conditions are met:
  - 1. Adequate stability has been attained.
  - 2. The material has cooled sufficiently to prevent distortion or loss of fines.
  - 3. The pavement has achieved a maximum temperature of 140 degrees F.
- B. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the Designer.

3.17 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from the Project site, and legally dispose of them in an EPA-approved landfill.

End of Section

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Section 32 13 13  
CONCRETE PAVING

**PART 1-GENERAL**

**1.1 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

**1.2 DESCRIPTION OF WORK**

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:
  - 1. Cement concrete paving, including walkways, ramps and accessible curb cuts.
  - 2. Concrete base for unit pavers.
  - 3. Pavement-marking paint.
- B. Alternates: Not Applicable.
- C. Items to Be Installed Only: Not Applicable.
- D. Items to Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
  - 1. Section 033000 - CAST-IN-PLACE CONCRETE for general building applications of concrete.
  - 2. Section 312000 - EARTH MOVING for subgrade preparation, grading, and subbase course.

**1.3 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Qualification Data: For manufacturer and testing agency.
- D. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
  - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- E. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Joint fillers.

F. Field quality-control test reports.

#### 1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the local authorities having jurisdiction for concrete asphalt paving work.

1. Comply with requirements of the Americans with Disabilities Act (ADA) and the Massachusetts Architectural Access Board (MAAB). If these requirements cannot be met with the grades and slopes indicated on the plans, notify the Designer immediately.
2. Comply with requirements of the local authorities having jurisdiction concerning the location and construction of accessible curb cuts.

C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

D. Mockups: Cast mockups of full-size sections of concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Designer.
2. Notify Designer seven days in advance of dates and times when mockups will be constructed.
3. Obtain Designer's approval of mockups before starting construction.
4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
5. Demolish and remove approved mockups from the site when directed by Designer.
6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:

- a. Contractor's superintendent.
- b. Independent testing agency responsible for concrete design mixtures.



- c. Ready-mix concrete producer.
- d. Concrete pavement subcontractor.
- e. Owner's Representative.

#### 1.5 ADA AND MAAB COMPLIANCE

- A. Comply with American with Disabilities Act (ADA) and the requirements of the Massachusetts Architectural Access Board (MAAB).
  - 1. Slopes: Walkways, as defined by Section 22.1 of 521 CMR, shall be graded to a maximum of 4.5%. The cross-pitch (perpendicular to travel) for walkways and paths shall be constructed at 1.5%. The slopes of ramps and side slopes on handicap curb cuts as defined by Section 21.1 of 521 CMR shall be constructed at 7% maximum. Ramps, as defined in Section 24.1 of 521 CMR, shall be constructed to a maximum slope of 7%.
  - 2. The Contractor is to assume that sidewalk grades will be verified and checked with a 2-foot long electronic 'smart level'.
  - 3. A 5'-0" minimum level area of 1.5% pitch shall be provided at entrances to buildings. Puddling or ponding of water at the entrances will not be accepted.
  - 4. Handicap parking spaces and access aisles shall be graded level with the slope not to exceed 1.8% in any direction.
  - 5. The requirements specified hereinabove shall supersede the grades indicated on the Drawings. If these requirements cannot be met with the grades indicated on the Drawings, the Designer shall be notified immediately for direction.

#### 1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Environmental Limitations: Do not apply concrete materials if subgrade is wet or excessively damp, or if rain is imminent or expected before time required for adequate cure.
- C. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces, at a minimum ambient or surface temperature of 55° F for water-based materials, and not exceeding 95° F.

### PART 2-PRODUCTS

#### 2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight and smooth exposed surfaces.
  - 1. Use flexible or curved forms for curves with a radius 100 feet or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces and contains no PCBs or other restricted chemicals.

#### 2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

- B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- D. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.
- E. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
- F. Plain Steel Wire: ASTM A 82, as drawn.
- G. Deformed-Steel Wire: ASTM A 496.
- H. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
- I. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- J. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice."
- K. Zinc Repair Material: ASTM A 780.

## 2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:
  - 1. Portland Cement: ASTM C 150, Type I or II. Supplement with the following:
    - a. Fly Ash: ASTM C 618, Class C or F.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source.
- C. Water: ASTM C 94/C 94M.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: ASTM C 494/C 494M, of type suitable for application, certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

## 2.4 FIBER REINFORCEMENT

- A. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III.

## 2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth.

- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

## 2.6 AUXILIARY MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.
- B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- C. Pavement-Marking Paint: Acrylic/latex type, low VOC, waterborne emulsion, lead, and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of fewer than 45 minutes.
  - 1. Color: As indicated.
- D. Detectable Warning Panels shall have dome geometry in accordance with ADA Regulations for Detectable Warning on Curb Ramps. They shall be raised truncated domes with a nominal diameter of 0.9-inches, a nominal height of 0.2-inches, and a center-to-center spacing of 1.6 inches to 2.4-inches. Panels shall be 24-inches deep in the direction of travel and the full width of the proposed ramp. The panel shall be a homogeneous glass and carbon reinforced composite, which is colorfast, and UV stable. The panel is to be colored throughout and not a painted coating. The color is to be contrasting to the background sidewalk color. The panels shall have a compressive strength in excess of 10,000 psi, flexural strength in excess of 3,000 psi and a slip resistance in excess of 0.8 wet or dry.
- E. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.
  - 1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.

## 2.7 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, with the following properties:
  - 1. Compressive Strength (28 Days): 3500 psi.
  - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
  - 3. Slump Limit: 4 inches, plus or minus 1 inch.
  - 4. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch nominal maximum aggregate size.

- B. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
- C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 requirements as follows:
  - 1. Fly Ash or Pozzolan: 25 percent.
  - 2. Ground Granulated Blast-Furnace Slag: 50 percent.
  - 3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- D. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb./cu. yd.

## 2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.
  - 1. When air temperature is between 85° F and 90° F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90° F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
  - 1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  - 2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
  - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

## PART 3-EXECUTION

### 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

### 3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

### 3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

### 3.4 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, buildings, frost pads, other fixed objects, and where indicated.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, to match jointing of existing adjacent concrete pavement.
- E. Edging: Tool edges of pavement and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

### 3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Moisten subbase to provide a uniform dampened condition at time concrete is placed.
- C. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- D. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- E. Screed pavement surfaces with a straight edge and strike off.
- F. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- G. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40° F, uniformly heat water and aggregates before mixing, to obtain a concrete mixture temperature of not less than 50° F and not more than 80° F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

### 3.6 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared, and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8-inch-deep with a stiff-bristled broom, perpendicular to line of traffic.
- C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on pavement surface according to manufacturer's written instructions.
  1. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
  2. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose non-slip aggregate.

### 3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb./sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture-retaining-cover curing or curing compound, as follows:
  1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed with waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy

rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

### 3.8 PAVEMENT TOLERANCES

- A. Accessibility: Comply with requirements of Massachusetts Architectural Access Board and ADAAG requirements. Remove and replace paving that does not meet required tolerances when measured with a 2-foot straight edge.
- B. Comply with tolerances of ACI 117 and as follows:
  - 1. Elevation: 1/4 inch.
  - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
  - 3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
  - 4. Joint Spacing: 3 inches.
  - 5. Contraction Joint Depth: Plus 1/4 inch, no minus.
  - 6. Joint Width: Plus 1/8 inch, no minus.

### 3.9 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement has been verified with Designer.
- B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

### 3.10 WHEEL STOPS

- A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes drilled or cast into wheel stops at one-quarter to one-third points. Firmly bond each dowel to wheel stop and to pavement. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

### 3.11 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Cooperate with the Independent Testing Agency engaged by Owner for field quality control activities for the Work of this Section. Refer also to Section 014325 - TESTING AGENCY SERVICES.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
  3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
  4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40° F and below and when 80° F and above, and one test for each composite sample.
  5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
  6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
    - a. A compressive-strength test shall be the average compressive strength of 2 specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if average of any 3-consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Designer, Owner's Representative, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or another nondestructive device may be permitted by Designer but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Designer.
- G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.12 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
- B. Drill test cores, where directed by Designer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.



- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

End of Section

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Section 32 31 13  
CHAIN LINK FENCES & GATES

PART 1 GENERAL

1.00 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this section.

1.01 WORK INCLUDED

- A. Provide all equipment and materials, and do all work necessary to construct the chain link fence and gate, as indicated on the Drawings and as specified.

1.02 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. Other specification sections which directly relate to the work of this section include, but are not limited to the following:

1. Section 31 21 00, EARTHWORK; Excavation and backfill and establishing subgrade elevations.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

1. American Society for Testing and Materials (ASTM):

|       |  |
|-------|--|
| A 53  | Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless  |
| A 90  | Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles   |
| A 123 | Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip |
| A 153 | Zinc-Coating (Hot-Dip) on Iron and Steel Hardware  |
| A 385 | High-Quality Zinc Coatings (Hot-Dip)   |

|       |   |
|-------|---|
| A 392 | Zinc-Coated Steel Chain-Link Fence Fabric   |
| A 569 | Steel, Carbon (0.15 Maximum Percent) Hot-Rolled Sheet and Strip, Commercial Quality |
| B 6   | Zinc (Slab Zinc)  |
| F 567 | Installation of Chain-Link Fence  |
| F 668 | Poly (Vinyl Chloride)(PVC)-Coated Steel Chain-Link Fence Fabric                     |

2. Chain Link Fence Manufacturers Institute (CLFMI):

|        |                |
|--------|----------------|
| Manual | Product Manual |
|--------|----------------|

1.04 QUALITY ASSURANCE

- A. Galvanized steel chain link fencing shall be manufactured in accordance with the requirements of the CLFMI Manual. Fence manufacturer shall be a CLFMI member.
- B. Fence manufacturer shall have at least ten years of experience in the manufacture of galvanized steel chain link fencing.

1.05 SUBMITTALS

- A. Submit sample of fence fabric for Architect's review prior to installation.
- B. Shop Drawings shall be submitted for all fence materials, including, gate assembly and related hardware, for Architect's review.
- C. Submit manufacturer's certification that all fence materials conform to specification requirements.

PART 2 PRODUCTS

2.01 METALLIC COATED FENCE FABRIC

- A. Fabric shall be zinc-coated by the hot-dip process after fabrication in accordance with ASTM A 392, "Class 2" galvanizing with black vinyl coating. Weight of the zinc coating shall be not less than 2.0 oz. per sq. ft. Zinc used for coating shall conform to ASTM B 6.
- B. Fabric shall be woven into a 2 in. mesh of 9 finished gauge (0.148 in.) galvanized wire with a minimum breaking strength of 1290 lb. in accordance with ASTM F 668, Class 2b.
- C. Fabric around tennis courts shall be woven into a 1 in. mesh of 9 finished gauge (0.148 in.) galvanized wire with a minimum breaking strength of 1290 lb. in accordance with ASTM F 668, Class 2b.

2.02 CHAIN LINK FENCE POSTS, HARDWARE, AND FITTINGS - GENERAL

- A. Fittings shall be of best quality malleable iron casting, wrought iron forgings, or pressed steel and provided with pin connections. Equipment shall be designed to carry 100% overload.

1. Malleable iron castings shall be hot-dipped galvanized in accordance with ASTM A 153.
  2. Wrought iron forgings or pressed steel fitting and appurtenances shall be hot-dipped galvanized in accordance with ASTM A 123.
  3. Fence hardware coatings shall match fence fabric coating.
- B. Piping for posts and rails shall be the following:
1. Piping shall be Schedule 40 hot-dip galvanized steel pipe, conforming to ASTM A 53.
    - a. Zinc used for coating shall conform to ASTM B 6, High Grade and Special High Grade Zinc. Minimum average zinc coating shall be 1.8 oz./sq. ft. meeting ASTM F 1083 for standard weight (Schedule 40) galvanized pipe.
- C. Galvanized items shall be galvanized in accordance with ASTM A 123, A 153, or A 385, as applicable.
- D. Bolts which are installed 6 ft. or less above grade shall not protrude more than 1/4 in. beyond the nut after tightening. Rough edges shall be filed smooth to the satisfaction of the Architect. Peen ends of all bolts after tightening.

#### 2.03 POSTS

- A. Line post shall be 2.375 in. O.D., Schedule 40 pipe weighing 3.65 lb./ft.
- B. End and corner posts shall be 2.875 in. O.D. Schedule 40 pipe weighing 5.79 lb./ft.
- C. Gate Posts - (Gate leaf Single Width): All gate posts shall be of sufficient strength so that the total deflection of the gate frame and the gate post at the end of the gate leaf shall not exceed the lesser of 2% of the gate leaf width or 4 in.
1. Up to 6 ft. width: Shall be 2.875 in. O.D., Schedule 40 pipe weighing 5.79 lb./ft.
  2. Over 6 ft. width up to and including 12 ft. width: Shall be 4.0 in. O.D., Schedule 40 pipe weighing 9.10 lb./ft.

#### 2.04 CHAIN LINK RAILS AND POST BRACES

- A. Bottom rail and mid-rail, and post braces shall be 1-5/8 in. O.D. Schedule 40 pipe weighing 2.27 lb./ft.
- B. Truss braces: Fence shall have a brace rail of 1-5/8 in. O.D. between each terminal post and the next adjacent line post. Each brace rail shall have attachments for a 5/16 in. vinyl coated truss rod and turnbuckle attachment.
- C. Top rail shall be 1-5/8 in. O.D., Schedule 40 pipe weighing 2.27 lb./ft.

#### 2.05 CHAIN LINK FENCE GATES AND GATE FRAMES

- A. Fabrication: Assemble gate frames by welding connections. Use same fabric as for fence, unless otherwise indicated. Install fabric with stretcher bars at edges, (and tie wire at top and bottom edges, if stretcher is not used). Attach stretcher bars to gate frame at not more than 15 in. o.c. Attach hardware with rivets or by other means which will provide security against removal or breakage.

1. Framing:
    - a. 4-6 ft. high, up to 8 ft. wide: Fabricate perimeter frames of minimum 1.660 in. O.D. Schedule 40 pipe weighing 2.27 lb./ft..
  2. Bracing:
    - a. Provide diagonal cross-bracing consisting of 3/8 in. diameter adjustable length truss rods on gates where four sided tension rods are not used. Provide frame rigidity without sag or twist.
    - b. Provide 1.90 in. O.D. Schedule 40 pipe for vertical center stays on each gate leaf assembly for double gates where gate width is 16 ft. and greater.
- B. Gate Hardware: Galvanize per ASTM A 153 (each gate)
1. Hinges: Pressed steel or malleable iron to suite gate size, non-lift-off type, offset to permit 180<sup>0</sup> gate opening. Provide one pair of hinges for each leaf. (Up to 12 ft. ht.)
  2. Latch: Forked type to permit operation from either side of gate: Provide padlock eye as integral part of latch.
  3. Keeper: Provide keeper for gates, which automatically engages the gate leaf and holds it in the open position until manually released.
- 2.06 STRETCHER BARS
- A. Stretcher bars shall not be less than 3/16 in. x 3/4 in. and be full height of the fabric with which they are being used.
    1. Provide stretcher bars for each gate, end, corner and pull post.
  - B. Stretcher bar bands and clips shall be heavy pressed steel, or malleable iron. At square post provide special design clips.
  - C. Attachment bolts for bands shall be 5/16 in. x 1-1/2 in. galvanized carriage bolts with nuts, to match fence.
- 2.07 CAPS
- A. Posts shall have caps which shall be designed to exclude water from post. Caps shall have holes suitable for the through passage of the top rail where necessary.
- 2.08 TENSION AND TIE WIRE
- A. Tension wire shall be 7 gauge galvanized wire. Fabric shall be attached to the tension wire at intervals of 24 in. with tie wire.
  - B. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
  - C. Hot-Dip Galvanized Steel: 0.148-inch- (3.76-mm) diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

2.09 GALVANIZED PAINT

- A. Cold galvanized paint for field touch-up shall be one of the following:

| <u>Product</u>          | <u>Manufacturer</u>   |
|-------------------------|---|
| Galvicon<br>Zinc Shield | Galvicon Corporation<br>Stanley Chemical Division of<br>the Stanley Works |

2.10 CONCRETE

- B. Concrete shall be air-entrained type, conforming to Section 033000, CAST-IN-PLACE CONCRETE, except as modified below:
1. Minimum 28 day compressive strength shall be 2500 psi.
  2. Maximum size of aggregate shall be 1-1/2 in.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Chain link fence installation shall conform to ASTM F 567, except as modified below.
- B. Line posts shall be placed at not more than 10 ft. on center, or as indicated on Drawings.
- C. Fence shall be 4 or 6 ft. height, from finish grade to top rail, of length and layout as indicated on Drawings. Fencing at Tennis courts will be matching current height (minimum of 10' ht).
- D. Install fabric on security side of fence. Wire fabric shall be attached to frame, and tightly stretched such that it is flat, in uniform tension with no bulges or warping of fence or gate after pulling force is released. Ties shall be spaced at 15 in. on horizontal rails and braces, and 12 in. on posts. Bend ends of wire to minimize hazard to person or clothing. Set selvage at 1-1/2 in. below top of rail as indicated on the Drawings. Top of fence shall approximately follow grade and shall have no abrupt changes in slope. Height of fence shall be constant.
1. Fasteners: Install nuts for tension band and hardware bolts on side of fence opposite fabric side.
  2. Bolts: Used in the construction of fence shall be thoroughly peened.
- E. Tension Wire: Provide tension line at bottom of fabric and at top (if top rail is not specified). Install tension wires before stretching fabric and tie to each post with ties or clips. Attach to fabric with hog rings 24 in. o.c.
- F. Stretcher Bars: Extend through fabric and secure to end, corner, pull and gate posts with bands or clips spaced not over 15 in. o.c.

3.02 GATES

- A. Install gates plumb, level, and secure for full opening without interference.
- B. Gate dimension is the center to center spacing of gate posts.
- C. Gates shall work freely and shall have adequate clearance of the bottom. Adjust for smooth operation.

3.03 FOUNDATIONS

- A. General: Unless otherwise indicated on the Drawings, footing diameter shall be four times the largest cross section of the post. The depth shall be as indicated on the Drawings.
- B. Concrete shall be crowned at top to shed water.
- C. Post hole footings shall be allowed to cured 72 hours prior to any additional work.

3.04 POSTS

- A. Layout:
  - 1. End, corner and pull post: Provide at each termination and change in horizontal or vertical direction of 30 degrees or more.
  - 2. Line Posts: Space uniformly at approximately 10 feet on center.
- B. Concrete Set Posts: (Corner, End and Pull Posts) Drill holes (after final grading) in firm, undisturbed or compacted soil. Holes shall have a diameter equal to four times the diameter of the post, and depths approximately 6 in. deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads.
  - 1. Set post not less than 35 in. below surface when in firm, undisturbed soil.
  - 2. Place concrete around posts in a continuous pour, tamp for consolidation. Trowel finish tops of footings, and slope or dome to direct water away from posts, except at walks.
  - 3. Gate posts and hardware: Set keepers, stops, sleeves and other accessories into concrete.

3.05 BRACING AND FRAMING

- A. Bracing: Install horizontal pipe brace at mid height for fences 6 ft. and over, on each side of corner posts and at gate, end, and pull posts. Firmly attach with proper fittings. Install diagonal tension rods at these points. Install braces so posts are plumb when diagonal rod is under proper tension.
- B. Top Rail:
  - 1. Random length, averaging not less than 18 feet.
  - 2. Pressed steel sleeve joints, for rigid connections and expansion/contraction.



3.06 TOUCH UP

- A. Following installation, scratches and marred spots in galvanized surfaces shall be power wire brushed and painted with a cold-applied galvanized paint at a rate of 2.0 oz. zinc per sq. ft. of surface.

END OF SECTION

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Section 32 32 23  
SEGMENTAL RETAINING WALLS

**PART 1 – GENERAL**

**1.1 DESCRIPTION**

- A. Work includes furnishing and installing precast modular concrete retaining walls to the lines and grades designated on the Contract Drawings and as directed by the Architect/Engineer. Also included is furnishing and installing appurtenant materials required for construction of the retaining wall as shown on the Contract Drawings.

**1.2 REFERENCE STANDARDS**

- A. Segmental Retaining Wall Units
  - 1. ASTM C 140 - Sampling and Testing Concrete Masonry Units
  - 2. ACTM C 90 - Hollow Load-Bearing Concrete Masonry Units
  - 3. ASTM C 145 - Solid Load-Bearing Concrete Masonry Units
- B. Geosynthetic Reinforcement
  - 1. ASTM D 4595 - Tensile Properties of Geotextiles by the Wide-Width Strip Method.
  - 2. ASTM D 5262 - Test Method for Evaluating the Unconfined Creep Behavior of Geosynthetics
  - 3. GRI: GG1 - Single Rib Geogrid Tensile Strength
  - 4. GRI: GG5 - Geogrid Pullout
- C. Soils
  - 1. ASTM D 698 – Moisture-Density Relationship for Soils, Standard Method
  - 2. ASTM D 422 - Gradation of Soils
  - 3. ASTM 4318 - Atterberg Limits of Soil
- D. Drainage Pipe
  - 1. ASTM D1248 - Specification for Corrugated Plastic Pipe
- E. Where specifications and reference documents conflict, the Architect/Engineer shall make the final determination of applicable document.

**1.3 SUBMITTALS**

- A. Material Submittals: The Contractor shall submit manufacturers' certifications two weeks prior to start of work stating that the units and geosynthetic reinforcement meet the requirements of Section 2 of this specification.
- B. Design Submittal: The Contractor shall submit two sets of detailed design calculations and construction drawings for approval at least three weeks prior to the beginning of wall construction. Construction drawings shall include details for fence installation. All calculations and drawings shall be prepared and sealed by a professional Civil Engineer experienced in wall design and licensed in the state of Massachusetts.

1.4 DELIVERY, STORAGE AND, HANDLING

- A. Contractor shall check materials upon delivery to assure that specified type and grade of materials have been received and proper color and texture of units have been received.
- B. Contractor shall prevent excessive mud, wet concrete, epoxies, and like materials which may affix themselves, from coming in contact with materials.
- C. Contractor shall store and handle materials in accordance with manufacturer's recommendations.
- D. Contractor shall protect materials from damage. Damaged materials shall not be incorporated into the retaining wall.

**PART 2 – MATERIALS**

2.1 SEGMENTAL RETAINING WALL UNITS

- A. Units shall be machine formed, Portland Cement precast concrete blocks specifically designed for retaining wall applications. Block units shall be Redi-Rock Limestone blocks or approved equal.
- B. Unit faces shall be of straight geometry.
- C. Units shall be manufactured in accordance with ASTM C 90, C 140, and C 145, as applicable.
- D. Units shall be solid through the full depth of the unit.
- E. Units shall be capable of being erected with the horizontal gap between adjacent units not exceeding 1/8 inch.
- F. For any corners shown on the construction plans, units shall be capable of providing overlap of units on each successive course so that walls meeting at corner are interlocked and continuous. Units that require corners to be mitered shall not be allowed.
- G. Units shall be capable of providing a split face, textured surface for all vertical surfaces that will be exposed after completion of wall, including any exposed sides and backs of units.
- H. Units shall be sound and free of cracks or other defects that would interfere with the proper placing of the unit or significantly impair the strength or permanence of the structure. Cracking or excessive chipping is grounds for rejection. Units showing cracks longer than 1/2" shall not be used within the wall. Units showing chips shall not be used within the wall.
- I. Concrete used to manufacture units shall have a minimum 28 days compressive strength of 3,000 psi and a maximum moisture absorption rate, by weight, of 8% as determined in accordance with ASTM C 140.
- J. Units' shall be interlocking and provide a vertical wall or a near vertical wall with maximum setback of 1 horizontally in 16 vertically.

**2.2 SEGMENTAL RETAINING WALL UNIT CONNECTION PINS**

- A. Units shall be interlocked with connection pins or other structurally acceptable methods. The pins shall consist of glass-reinforced nylon made for the expressed use with the units supplied.

**2.3 GEOSYNTHETIC REINFORCEMENT**

- A. When required, geosynthetic reinforcement shall consist of geogrids or geotextiles manufactured as a soil reinforcement element. The manufacturers/suppliers of the geosynthetic reinforcement shall have demonstrated construction of similar size and types of segmental retaining walls on previous projects.
- B. The type, strength, and placement location of the reinforcing geosynthetic shall be as determined by the Civil Engineer, as shown on the approved shop drawings.

**2.4 LEVELING PAD**

- A. Material for leveling pad shall consist of compacted gravel and shall be a minimum of 6 inches in depth. Lean concrete with a strength of 200-300 psi and three inches thick maximum may also be used as a leveling pad material. The leveling pad should extend laterally at least a distance of 6 inches from the toe and heel of the lowermost unit.

**2.5 DRAINAGE AGGREGATE**

- A. Drainage aggregate shall be angular, clean stone or granular fill meeting the following gradation of ¾-inch crushed stone as defined in Section 31 20 00 Earth Moving.

**2.6 DRAINAGE PIPE**

- A. The drainage collection pipe shall be a perforated or slotted HDPE pipe, as specified in Section 33 40 00 Storm Drainage Utilities.

**PART 3 – EXECUTION**

**3.1 DESIGN**

- A. The design provided by the Contractor and prepared by the manufacturer and Civil Engineer shall consider the internal and local stability of the soil mass and shall be prepared in accordance with acceptable engineering practice, specifications, and applicable code requirements. The design shall consider all loading conditions, including live loads of vehicles, guardrail, and temporary loading imposed during construction. Geotechnical investigations shall be made by the wall designer and the wall system shall be designed for a total settlement not to exceed one-inch.

**3.2 EXCAVATION**

- A. Contractor shall excavate to the lines and grades shown on the Contract Drawings. Contractor shall take precautions to minimize over-excavation. Over-excavation shall be filled with compacted gravel at the Contractor's expense.
- B. Contractor shall verify location of existing structures and utilities prior to excavation. Contractor shall ensure all surrounding structures and surfaces are protected from the

effects of wall excavation. Excavation support, if required, is the responsibility of the Contractor.

### 3.3 FOUNDATION PREPARATION

- A. Following the excavation, the foundation soil shall be examined by the wall designer to ensure actual foundation soil strength meets or exceeds the assumed design bearing strength. Soils not meeting the required strength shall be removed and replaced with gravel, as directed by the Engineer.
- B. Foundation soil shall be proofrolled and compacted to 95% standard Proctor density and inspected by the Engineer prior to placement of leveling pad materials.

### 3.4 LEVELING PAD CONSTRUCTION

- A. Leveling pad shall be placed as shown on the approved shop drawings with a minimum thickness of 6 inches. The leveling pad should extend laterally at least a distance of 6 inches from the toe and heel of the lowermost unit.
- B. Soil leveling pad material shall be compacted to provide a firm, level bearing surface on which to place the first course of units. Well-graded sand can be used to smooth the top 1/2 to 1/4 inch of the leveling pad. Compaction will be with mechanical plate compactors to achieve 95% of maximum standard Proctor density (ASTM D 698).

### 3.5 MODULAR PRECAST CONCRETE UNIT INSTALLATION

- A. All units shall be installed at the proper elevation and orientation as shown on the wall elevations and details on the Contract Drawings, shop drawings, and as directed by the Engineer. The units shall be installed in general accordance with the manufacturer's recommendations.
- B. First course of units shall be placed on the leveling pad. The units shall be leveled side-to-side, front-to-rear and with adjacent units, and aligned to ensure complete contact with the leveling pad. The first course is the most important to ensure accurate and acceptable results. No gaps shall be left between the front of adjacent units. Alignment shall be maintained by means of a string line or offset from baseline to the back of the units.
- C. Clean all excess debris from top of units and install next course.
- D. Insert two connection pins through pin holes of each upper course unit into receiving slots in lower course units. Pins shall be fully seated in the pin slot below. Push units forward to remove any looseness in the unit-to-unit connection and then check alignment. Check level and alignment of the units.
- E. Layout of corners shall be installed in accordance with the shop drawings and in general accordance with manufacturer's installation guidelines. Walls meeting at corners shall be interlocked by overlapping successive courses.
- F. Repeat procedures to extent of wall height.

### 3.6 GEOSYNTHETIC REINFORCEMENT PLACEMENT

- A. If required, all geosynthetic reinforcement shall be installed at the proper elevation and orientation as shown on the shop drawings and as directed by the Engineer.
- B. At the elevations shown on the shop drawings, the geosynthetic reinforcement shall be laid horizontally on compacted gravel and on top of the concrete units. Embedment of the geosynthetic in the units shall be consistent with manufacturer's recommendations. Correct orientation of the geosynthetic reinforcement shall be verified by the Contractor to be in accordance with the geosynthetic manufacturer's recommendations. The highest strength direction of the geosynthetic must be perpendicular to the wall face.
- C. Geosynthetic reinforcement layers shall be one continuous piece for their entire embedment length. Overlap of the geosynthetic in the design strength direction (perpendicular to the wall face) shall not be permitted.
- D. Tracked construction equipment shall not be operated directly on the geosynthetic reinforcement. A minimum of 6 inches of backfill is required prior to operation of tracked vehicles over the geosynthetic. Turning should be kept to a minimum. Rubber-tired equipment may pass over the geosynthetic reinforcement at slow speeds (less than 5 mph).
- E. The geosynthetic reinforcement shall be in tension and free of wrinkles prior to placement of soil fill. The nominal tension shall be applied to the reinforcement and secured in place with staples, stakes or by hand tensioning until reinforcement is covered by six inches of fill.

### 3.7 DRAINAGE MATERIALS

- A. Drainage aggregate shall be installed to the line, grades, and sections shown on the shop drawings. Drainage fill shall be placed to the minimum thickness shown on the Contract Drawings between and behind units.
- B. Drainage collection pipes shall be installed to maintain gravity flow of water outside the reinforced soil zone, as indicated on the Contract Drawings.

### 3.8 BACKFILL PLACEMENT

- A. The gravel backfill shall be placed as shown in the construction plans in the maximum compacted lift thickness of 10 inches and shall be compacted to a minimum of 95% of standard Proctor density (ASTM D 698) at a moisture content within 2% of optimum. The backfill shall be placed and spread in such a manner as to eliminate wrinkles or movement of the geosynthetic reinforcement and the units.
- B. Only hand-operated compaction equipment shall be allowed within 3 feet of the front of the wall face. Compaction within the 3 feet behind the wall face shall be achieved by at least three (4) passes of a lightweight mechanical tamper, plate, or roller.
- C. At the end of each day's operation, the Contractor shall slope the last level of backfill away from the wall facing to direct water runoff away from the wall face.
- D. At completion of wall construction, backfill shall be placed level with final top of wall elevation. If final grading, paving, landscaping, and/or storm drainage installation adjacent to the wall is not placed immediately after wall completion, temporary surface drainage shall be provided to ensure water runoff is not directed at the wall nor allowed to collect or pond behind the wall until final construction adjacent to the wall is completed.

3.9 WALL CAPS

- A. Caps shall be properly aligned and installed along the top of the wall.
- B. Caps shall overhang the top course of units by 3/4 to 1 inch. Slight variation in overhang is allowed to correct alignment at the top of the wall.

3.10 CONSTRUCTION ADJACENT TO COMPLETED WALL

- A. The Contractor is responsible for ensuring that construction adjacent to the wall by others does not disturb the wall or place temporary construction loads on the wall that exceed design loads, including loads such as water pressure, temporary grades, or equipment loading. Heavy paving or grading equipment shall be kept a minimum of three feet behind the back of the wall face. Care should be taken by the Contractor to ensure water runoff is directed away from the wall structure until final grading and surface drainage collection systems are completed.

End of Section



Section 32 91 13.16  
MULCH

PART 1 GENERAL

1.0 RELATED DOCUMENTS

- A. Division 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS and applicable parts of Division 01 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.

1.1 DESCRIPTION OF WORK

- A. Provide all equipment and materials, and do all work necessary to construct the stone mulch surfacing in planting areas as shown and as drip strip around the building, as indicated on the Drawings and as specified.

1.2 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
  - 1. Section 31 20 00, EARTH MOVING Excavation, backfill, compaction and establishment of subgrade elevations.
  - 2. Section 32 80 00, IRRIGATION SYSTEM
  - 3. Section 32 93 00, TREES, PLANTS AND GROUND COVERS

1.3 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. American Society for Testing and Materials (ASTM):
    - D 1557                                      Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lb. (4.54-kg) Rammer and 18-in. (475-mm) Drop
  - 2. Massachusetts Department of Transportation (MassDOT)
    - Specifications                                      Standard Specifications for Highways and Bridges

1.4 SUBMITTALS

- A. Samples: Stone Mulch  
A 2 lb. sample of stone aggregate shall be submitted for the Architect's approval of material gradation and color, to be native/tan color range.

1.5 TESTING AND INSPECTION

- A. The Owner reserves the right to test and inspect materials and construction of stone dust surfacing in accordance with the requirements of Section 014500, QUALITY CONTROL.

PART 2 PRODUCTS

2.1 CRUSHED NATIVE STONE MULCH

- A. Crushed native stone for surfacing shall be in the tan range, 3/8" - 1/2" crushed, washed, stone meeting the following gradation:

| <u>Sieve Size</u> | <u>% Passing by Weight</u> |
|-------------------|----------------------------|
| 1/4 in.           | 100                        |
| 3/8 in.           | 80 - 100                   |
| No. 4             | 15 - 85                    |
| No. 8             | 0 - 5                      |
| No. 200           | < 1                        |

2.2 PRE-EMERGENT HERBICIDE

- A. Herbicide shall be LESCO Ornamental Herbicide 5G, pre-emergent grassy and selected broadleaf weed control for ornamental plants, nursery stock and ground covers, #019515, manufactured by LESCO, Rocky River, OH 44116; Sierraron, manufactured by Scotts; Preen, manufactured by Lebanon Seaboard Corporation, or approved equal.

PART 3 EXECUTION

3.1 GRADING

- A. Areas to receive crushed native stone mulch will be planted and brought to finished grade before work of this section is performed. Final fine grading, furnishing and installing crushed native stone mulch and these materials as required to form a uniform, accurate, aggregate at required elevations and to required lines, shall be done under this Section.
- B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to this Section.
- C. Excavation required in subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade, subsequent backfill and compaction shall be performed as directed

by the Architect as specified in Section 31 20 00, EARTH MOVING and Section 329300 Trees, Plants and Groundcovers. Completed subgrade after filling such areas shall be uniformly and properly graded.

- D. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 1 in. deep in subgrade, shall be graded out, reshaped as required, and recompact before placing crushed native stone surfacing.
- E. Materials shall not be stored or stockpiled on subgrade.
- F. Disposal of debris and other material excavated and/or stripped under this section, and material unsuitable for or in excess of requirements for completing work of this section shall be disposed of off-site.

### 3.2 STONE MULCH

- A. Mulches shall be installed only after excavation, construction and planting or any other work which might injure it has been completed. Damage caused during construction shall be repaired before acceptance.
- B. Crushed native stone mulch shall be installed in planting areas as shown on the construction drawings to a depth as indicated in the details.
- D. Water shall be added to crushed native stone mulch as required to remove any fines that may have settled during installation.

END OF SECTION

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Section 32 91 19  
LANDSCAPE GRADING

PART 1 GENERAL

1.00 GENERAL PROVISIONS

- A. Attention is directed to the AGREEMENT AND GENERAL CONDITIONS and all Sections within DIVISION 1, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.01 WORK INCLUDED

- A. Provide all equipment and materials, and do all work necessary to complete the site grading as indicated on the Drawings and as specified.

1.02 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
1. Section 312000, EARTHWORK; Excavation, backfill; establishment of subgrade elevations.
  2. Section 329200, LAWNS AND GRASSES.
  3. Section 329300, TREES, PLANTS AND GROUND COVERS.

1.03 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Society for Testing and Materials (ASTM):

|               |  |
|---------------|--|
| D 698         | Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft <sup>3</sup> (6000kN-m/m <sup>3</sup> )) |
| D 1556        | Density of Soil in Place by the Sand-Cone Method   |
| D 2167<br>the | Density and Unit Weight of Soil In Place by<br>Rubber-Balloon Method   |

1.04 EXISTING CONDITIONS

- A. By submitting a bid, the Contractor affirms that he has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.

1.05 QUALITY CONTROL

- A. The Architect reserves the right to perform on-site observation during the grading operations. The observations may include, but not be limited to the following:
  - 1. Observation of subgrade preparation for slab-on-grade and paved areas.
  - 2. Observation of rough and finish grading operations.
- B. All grade breaks shall be staked with grade stakes at each end, any change of direction, and at 20' centers along the length for Architect's review during grading operations.
- C. Perform field density tests in accordance with ASTM D 1556 or ASTM D 2167.
  - 1. Make at least one field density test of the subgrade for every 2000 sq. ft. of paved area, but in no case less than three tests.
  - 2. In each compacted fill layer, make one field density test for every 2000 sq. ft. of overlaying paved area, but in no case less than three tests.
  - 3. Make at least one field density test of the planting soil for every 2000 sq. ft. of plant bed area, but in no case less than three tests.
  - 4. Make at least one field density test of the planting soil for every 2000 sq. ft. of lawn area, but in no case less than three tests.
- D. If, in the opinion of the Architect, based on reports of the testing service and inspection, the subgrade or fills which have been placed are below the specified density, additional compaction and testing will be required until satisfactory results are obtained.
  - 1. The results of density tests of soil-in-place will be considered satisfactory if the average of any four consecutive density tests which may be selected are in each instance equal to or greater than the specified density, and if not more than one density test out of five has a value more than 2% below the required density.
- E. The Architect's presence does not include supervision or direction of the actual work by the Contractor, his employees, or agents. Neither the presence of the Landscape Architect, nor any observations and testing performed by him shall excuse the Contractor from defects discovered in his work.

1.06 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. The work shall be executed in such manner as to prevent any damage to adjacent property and any other property and existing improvements such as, but not limited to: streets, curbs, paving, utility lines and structures, monuments, bench marks and other public and private property.
- B. In case of any damage or injury caused in the performance of the grading work, the Contractor shall, at his own expense, make good such damage or injury to the satisfaction of, and without cost to the Owner. Existing roads, sidewalks, and curbs damaged during the grading work shall be repaired or replaced to their original condition at the completion of operations. The Contractor shall replace, at his own cost, existing bench marks, monuments, and other reference points which are disturbed or destroyed.

1.07 COORDINATION

- A. Prior to start of grading operations, the Contractor shall arrange an on-site meeting with the Architect for the purpose of establishing Contractor's schedule of operations and scheduling inspection procedures and requirements.
- B. As construction proceeds, the Contractor shall be responsible for notifying the Architect prior to start of grading operations requiring inspection and/or testing.
- C. The Contractor shall be responsible for obtaining test samples of soil materials proposed to be used and transporting them to the site sufficiently in advance of time planned for use of these materials for testing of materials to be completed. Use of these proposed materials by the Contractor prior to testing and approval or rejection, shall be at the Contractor's risk.

PART 2 - PRODUCTS

2.01 SOURCE OF MATERIALS

- A. Material shall be obtained from required on-site excavation, to the extent that suitable material is available, and from off-site sources, to the extent that suitable material is not available from on-site excavation.
- B. Refer to Section 329200 and Section 329300 for preparation and placement of planting soils.

PART 3 - EXECUTION

3.01 COMPACTION

- A. Refer to Section 312000, EARTHWORK for required levels of subgrade compaction at paved areas.
  - 1. Unless otherwise indicated, scarified subgrade in landscape areas shall be compacted to 86% - 88% compaction ASTM D698 Standard Proctor.
  - 2. Planting Soil – Planting Pits and Beds: shall be spread in lifts not greater than 6 inches and compacted to a density between 82 and 86 percent Standard Proctor Maximum Dry Density.
  - 3. Planting Soil - Lawn Areas: shall be spread over the area and shall be compressed to a density of 86 to 88% Standard Proctor maximum dry density. No vibratory compaction of the subgrade or the planting medium shall take place. No rubber-tired equipment or heavy equipment except for a small bulldozer shall pass over soils after they have been loosened or planting medium spread.

3.02 GRADING - GENERAL

- A. Uniformly grade areas within the limits of site grading under this section, including adjacent transition areas. Smooth finished surfaces within specified tolerances, and between points where elevations are shown, or between such points and existing grades.

- B. The degree of finish required will be that ordinarily obtainable from either blade-grader or scraper operations.

1. Ditches: Finish ditches to ensure proper flow and drainage. Conduct final rolling operations to produce a hard, uniform, and smooth cross-section.
2. Grade Breaks located on the plans indicate crisp transitions, not blended or rounded edges. These should be clean, sharp, and uniform in line and curve as indicated on the plans

### 3.03 ROUGH GRADING

- A. General: Rough grading shall include the shaping, trimming, rolling and refinishing of all surfaces of the subbase, shoulders, earth embankments and the preparation of grades as shown on the Drawings. The grade of shoulders and sloped areas may be done by machine methods.
- B. Do all cutting, filling and grading to lines and grades indicated on the Drawings. Grade evenly to within the dimensions required for grades shown on the Drawings and specified herein. No stones larger than 4 in. shall be placed in upper 6 in. of fill. Fill shall be left in compacted state at the end of work day and sloped to drain.
1. Architect may make such adjustments in grades and alignments as are found necessary to avoid special conditions encountered.
  2. Provide a smooth transition between adjacent existing grades and new grades.
  3. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

- C. Site Grading: Slope grades to direct water away from buildings and to prevent ponding.

Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).
4. Up to 2 in. in 10 ft. – 0 in. tolerance shall be permitted on slopes provided the slopes are uniform in appearance and without any abrupt changes.
5. Traffic of men and equipment across soil subgrade areas shall be prohibited following excavation to the required lines and grades.

### 3.04 FINE GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes.

Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.



B. Finish Grading:

1. Lawn or Unpaved Areas: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
2. Walks: Shape the surface of areas under walks to line, grade and cross-section, with the finish surface not more than 0.00 ft. above or 0.10 ft. below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains.
3. Pavements: Shape the surface of the areas under pavement to line, grade and cross-section, with the finish surface not more than 1/2 in. above or below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains. Include such operations as plowing, discing, and any moisture or aerating required to provide the optimum moisture content for compaction. Fill low areas resulting from removal of unsatisfactory soil materials, obstructions, and other deleterious materials, using satisfactory soil material. Shape to line, grade, and cross-section as shown on the Drawings.

3.05 MAINTENANCE

- A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades in settled, eroded, and rutted areas to the specified tolerances.
- C. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, re-shape, and compact to the required density prior to further construction.

3.06 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Remove waste materials, including excavated material classified as unsatisfactory soil material, trash and debris, and dispose of it legally off the Owner's property.

END OF SECTION

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Section 32 92 00  
LAWNS AND GRASSES

PART 1 GENERAL

1.0 RELATED DOCUMENTS

- A. Division 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS and applicable parts of Division 01 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.

1.1 DESCRIPTION OF WORK

- A. Provide all materials and equipment, and do all work required to complete the seeding and sodding of lawns, as indicated on the Drawings and as specified.

1.2 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 31 20 00, EARTH MOVING; Establishment of subgrade elevation.
2. Section 32 91 19, LANDSCAPE GRADING.
3. Section 32 93 00, TREES, PLANTS AND GROUND COVERS.

1.3 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Society for Testing and Materials (ASTM):

|       |  |
|-------|--|
| C 136 | Sieve Analysis of Fine and Coarse Aggregates |
| D 422 | Particle-Size Analysis of Soils              |
| E 11  | Wire-Cloth Sieves for Testing Purposes       |

1.4 SUBMITTALS

- A. Samples: The following samples shall be submitted:

| <u>Material</u> | <u>Quantity (lb.)</u> |
|-----------------|-----------------------|
| Seed, each mix  | 1                     |

- B. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following materials:

Cellulose fiber mulch

- C. Certificates: Labels from the manufacturer's container certifying that the product meets the specified requirements shall be submitted for the following materials:

Grass seed

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Digging Sod:

1. Sod shall not be dug at the nursery or approved source until ready to transport sod to the site of the work or acceptable storage location.
2. Before stripping, sod shall be mowed at a uniform height of 2 in.
3. Cut sod to specified thickness and to standard width and length desired.

- B. Transportation of Sod:

1. Sod transported to the Project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury. Closed vehicles shall be adequately ventilated to prevent overheating of the sod.
2. Evidence of inadequate protection following the digging, carelessness while in transit, or improper handling shall be cause for rejection.
3. Sod shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the sod is in transit, being handled, or are in temporary storage.
4. Upon arrival at the temporary storage location or the site of the work, sod material shall be inspected for proper shipping procedures. Should the sod be dried out, the Architect will reject the sod. When sod has been rejected, the Contractor shall at once remove it from the area of the work and replace it with acceptable material.
5. Unless otherwise authorized by the Architect, the Contractor shall notify the Architect at least two working days in advance of the anticipated delivery date of sod material. Certificate of Inspection when required shall accompany each shipment.

- C. Handling and Storage of Sod:

1. Sod material shall be handled with extreme care to avoid breaking or tearing strips.
2. Sod shall not be stored for longer than 30 hours prior to installation. Sod shall be stored in a compact group and shall be kept moist. Sod shall be prevented from freezing.
3. Sod that has been damaged by poor handling or improper storage will be rejected by the Architect.

- D. Deliver seed in original sealed containers, labeled with analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging, location of packaging, and name of seed grower. Damaged packages will not be accepted.
- E. Seed shall be stored under cool and dry conditions so that the endophytic seed in the mixture is capable of maintaining a high level of endophytes
- F. Deliver fertilizer in sealed waterproof bags, printed with manufacturer's name, weight, and guaranteed analysis.

#### 1.6 PLANTING SEASON

- A. Planting season shall be as follows:

| <u>Material</u>     | <u>Planting Season</u> |               |
|---------------------|------------------------|---------------|
|                     | <u>Spring</u>          | <u>Fall</u>   |
| Seeding and sodding | 3/15 to 5/15           | 8/15 to 10/15 |

- B. Planting shall only be performed when weather and soil conditions are suitable for planting the material specified in accordance with locally accepted practice.
- C. Planting season may be extended with the written permission of the Architect.

#### 1.7 ACCEPTANCE

- A. Acceptance:

1. The Architect will inspect all work for Substantial Completion upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.
2. Acceptance of material by the Architect will be for general conformance to specified requirements, and shall not relieve the Contractor of responsibility for full conformance to the Contract Documents.
3. Upon completion and reinspection of all repairs or renewals necessary in the judgement of the Architect, the Architect will recommend to the Owner that the work of this Section be accepted.

- B. Sod and seed areas will be accepted when in compliance with all the following conditions:

1. Roots are thoroughly knit to the soil;
2. Absence of visible joints (sodded areas);
3. All areas show a uniform stand of specified grass in healthy condition;
4. At least 60 days have elapsed since the completion of work under this Section.

PART 2 PRODUCTS

2.1 GENERAL

- A. Materials shall be extracted or recovered and manufactured from within 500 miles of project site.

2.2 SEED

- A. Seed mixture: Seed mix shall be Crownvetch seeding mix (naturalized) ERNMX-109 by Ernst seeds, 8884 Mercer Pike Meadville, PA 16335, p: (800) 873-3321, [www.ernstseed.com](http://www.ernstseed.com) or approved equal. Seed mix plant material shall be moderately- highly shade tolerant and highly drought tolerant, mature plant heights shall not exceed 4' ht. Mix application per manufacturer's instructions.

SEED MIX

| <u>Name of Seed</u>       | <u>% by Weight<br/>in Mixture</u> | <u>Minimum %<br/>Purity</u> | <u>Minimum %<br/>Germination</u> |
|---------------------------|-----------------------------------|-----------------------------|----------------------------------|
| Coronilla varia, Penngift |                                   |                             |                                  |
|                           | 50                                | 98                          | 99                               |
| Lolium multiflorum        |                                   |                             |                                  |
|                           | 40                                | 98                          | 85                               |
| Trifolium hybridum        |                                   |                             |                                  |
|                           | 10                                | 90                          | 80                               |

2.3 SOD LAWN

- A. Certified Turfgrass Sod: Superior sod grown from certified, high quality seed of known origin or from plantings of certified grass seedlings or stolons. It shall be inspected by the certification agency of the state in which it is grown to assure satisfactory genetic identity and purity, overall high quality and freedom from noxious weeds as well as excessive quantities of other crop and weedy plants at time of harvest. All seed or original plant material in mixture must be certified. Turfgrass sod shall meet the published state standards for certification.
1. Sod shall be a mixture of four or five current and improved bluegrass varieties found in the top 25% of the NTEP (National Turfgrass Evaluation Proceedings), with last two tests spanning over 8 years. Mixture shall contain approximately equal proportions of each hybrid component.
- B. Sod shall be nursery grown on cultivated mineral agricultural soils. Sod shall have been mowed regularly and carefully, and otherwise maintained from planting to harvest.
- C. Thickness of Cut: Sod shall be machine cut at a uniform soil thickness of 5/8 in., plus or minus 1/4 in., at the time of cutting. Measurement for thickness shall exclude top growth and thatch.

- D. Strip Size: Individual pieces of sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be plus or minus 1/2 in. on width, and plus or minus 5% on length. Broken strips and torn and uneven ends will not be acceptable.
- E. Strength of Sod Strips: Standard size sections of sod shall be strong enough to support their own weight and retain their size and shape if suspended vertically when grasped in the upper 10% of the section.
- F. Moisture Content: Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival.
- G. Time Limitations: Sod shall be harvested, delivered, and transplanted within a 36 hour period unless a suitable preservation method is approved prior to delivery. Sod not transplanted within this period shall be inspected and approved by the Architect prior to its installation.
- H. Thatch: Sod shall be relatively free of thatch. A maximum of 1/2 in. (uncompressed) thatch will be permitted.
- I. Diseases, Nematodes, and Insects: Sod shall be free of diseases, nematodes, and soil-borne insects. State Nursery and Plant Materials Laws require that all sod be inspected and approved for sale. The inspection and approval must be made by the State Agricultural Department, Office of the State Entomologist.
- J. Weeds: Sod shall be free of objectionable grassy and broad leaf weeds. Turfgrass sod shall be considered free of such weeds if less than five such plants are found per 100 sq. ft. of area.
  - 1. Turfgrass sod shall not be acceptable if it contains any of the following weeds: common bermudagrass (wiregrass), quackgrass, johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel and brome grass.

#### 2.4 FESCUE SOD

- A. Fescue sod to be Certified No Mow Fine Fescue Sod: Superior sod grown from certified, high quality seed of known origin or from plantings of certified grass seedlings or stolons. It shall be inspected by the certification agency of the state in which it is grown to assure satisfactory genetic identity and purity, overall high quality and freedom from noxious weeds as well as excessive quantities of other crop and weedy plants at time of harvest. All seed or original plant material in mixture must be certified. No Mow Fescue sod shall meet the published state standards for certification.
  - 1. Sod shall be a mixture of three fescues: creeping red, chewing and hard fescues adapted to both mown and unmown conditions. Shall be grown in a controlled environment free of weeds, disease and insect infestations.
- B. Sod shall be nursery grown on cultivated mineral agricultural soils. Prior to harvesting No Mow fescue sod shall be mown to a height of 2" for shipment.
- C. Thickness of Cut: Sod shall be machine cut at a uniform soil thickness of 3/4 in., plus or minus 1/4 in., plus top growth at the time of cutting.

- D. Strip Size: Individual pieces of sod shall be cut to the supplier's standard width and length typically 24" wide x 48" long. Maximum allowable deviation from standard widths and lengths shall be plus or minus 1/2 in. on width, and plus or minus 5% on length. Broken strips and torn and uneven ends will not be acceptable.
- E. Strength of Sod Strips: Standard size sections of sod shall be strong enough to support their own weight and retain their size and shape if suspended vertically when grasped in the upper 10% of the section.
- F. Moisture Content: Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival.
- G. Time Limitations: Sod shall be harvested, delivered, and transplanted within a 36 hour period unless a suitable preservation method is approved prior to delivery. Sod not transplanted within this period shall be inspected and approved by the Architect prior to its installation.
- H. Thatch: Sod shall be relatively free of thatch. A maximum of 1/2 in. (uncompressed) thatch will be permitted.
- I. Diseases, Nematodes, and Insects: Sod shall be free of diseases, nematodes, and soil-borne insects. State Nursery and Plant Materials Laws require that all sod be inspected and approved for sale. The inspection and approval must be made by the State Agricultural Department, Office of the State Entomologist.
- J. Weeds: Sod shall be free of objectionable grassy and broad leaf weeds. No Mow Fescue sod shall be considered free of such weeds if less than five such plants are found per 100 sq. ft. of area.
  - 1. No Mow Fescue sod shall not be acceptable if it contains any of the following weeds: common bermudagrass (wiregrass), quackgrass, johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel and brome grass.

## 2.5 SOD FARM GROWING MEDIUM

- A. Sod farm growing medium shall be as specified in Section 329300, TREES, PLANTS AND GROUND COVERS..

## 2.6 PLANTING SOIL

- A. Planting soil shall be as specified in Section 329300, TREES, PLANTS AND GROUND COVERS.

## 2.7 WATER

- A. Water shall be suitable for irrigation and free from ingredients harmful to seeded or sodded areas.

## 2.8 SOIL AMENDMENTS

- A. A. Soil amendments shall be as specified in Section 329300, TREES, PLANTS AND GROUND COVERS.

## 2.9 CELLULOSE FIBER MULCH



- A. Cellulose fiber mulch shall be composed of virgin wood, contain a green color additive, be weed free, and non-polluting, containing no germination or growth - inhibiting factors, similar to Hydro Mulch, manufactured by Conwed Corporation, St. Paul, Minnesota 55113.

2.10 WEED CONTROL

- A. Weed control for stockpiled topsoil shall be a non-selective weed killer for control of grassy and broadleaf weeds; weed control shall have short residual, allowing seeding and sodding operations to occur within 7 days of application.

PART 3 EXECUTION

3.1 PREPARATION OF SUBGRADE

- A. Subgrade shall be examined and prepared in accordance with Section 329300, TREES, PLANTS AND GROUNDCOVERS.

3.2 PLACING AND SPREADING PLANTING SOIL

- A. Planting soil shall not be spread until it is possible to follow immediately or within 24 hours with seeding and sodding operations. If planting soil is spread prior to this time it shall be cultivated to loosen soil prior to seeding and sodding.
- B. Placing and spreading planting soil shall be performed as specified in Section 329300, TREES, PLANTS AND GROUNDCOVERS.

3.3 APPLICATION OF SOIL AMENDMENTS

- A. Fertilizer and conditioners shall be applied as specified in Section 329300, TREES, PLANTS AND GROUNDCOVERS.

3.4 FINISH GRADING

- A. Contractor shall set grade lines for Landscape Architect's review and approval. All work per Section 329119 LANDSCAPE GRADING.
  - 1. Final surface of topsoil immediately before seeding and sodding shall be within  $\pm 1/2$  in. of required elevation, with no ruts, mounds, ridges, or other faults, and no pockets or low spots in which water can collect. Stones, roots, and other debris greater than 1 in. in any dimension, which are visible at the surface, shall be removed and the resulting holes filled with topsoil, leaving a uniform planar surface.
- B. Finish grade surface with a drag or rake. Round out all breaks in grade, smooth down all lumps and ridges, fill in all holes and crevices. Rolling with a light roller is acceptable, if the surface is scarified afterward.
  - 1. Lawn: Compaction of topsoil for finish grade shall be 85% to 88%.
- C. In the event of settlement, the Contractor shall readjust the work to required finished grade.

### 3.5 SEED APPLICATION

- A. Seed shall be applied in two applications; first shall be by mechanical spreader; second shall be by hydroseeding method as specified below.
- B. First Application: Seed shall be broadcast by means of an approved mechanical spreader, to give a uniform application at rates recommended by seed supplier.
  - 1. Seed shall be applied in two equal applications for uniform coverage; direction of travel of spreader for second pass shall be perpendicular to that of the first pass. Seeding shall not be done when it is raining or snowing, or when wind velocity exceeds 5 mph.
  - 2. Following seeding the area shall be lightly raked to mingle seed with top 1/8 to 1/4 in. of soil. Area shall then be fine graded. Stones and other debris greater than 1 in. in any dimension which are visible on surface shall be removed.
- C. Following seeding and raking, entire area shall be rolled with a hand roller having a weight of 60 to 90 lb./ft. of width, and a minimum diameter of 2 ft. Entire area shall then be watered by use of lawn sprinklers, or other approved means. Initial watering shall continue until the equivalent of a 2 in. depth of water has been applied to entire seeded surface, at a rate which will not dislodge the seed. Watering shall be repeated thereafter as frequently as required to prevent drying of the surface, until the grass attains an average height of 1/4 in. Watering methods and apparatus which may cause erosion of the surface shall not be permitted.
- D. At Contractor's Option: In lieu of mechanical spreader, seed may be spread by the hydroseeding method, utilizing power equipment commonly used for that purpose.
  - 1. Seed, lime, fertilizer, and mulch shall be mixed and applied to achieve application quantities specified herein for the conventional seeding method, with mulch applied at the rate of 1,200 lb./acre. Other provisions specified above for conventional seeding shall apply also to hydroseeding.
  - 2. Mulch shall be applied in two stages with 5% to 10% of the quantity applied with seed and the balance applied separately.
  - 3. Seed shall not be placed in water until immediately before application.
  - 4. Centrifugal pumps shall not be used to apply seed mix without fiber mulch. Hand broadcast or use gear pump.
  - 5. Gelscape shall be incorporated at the rate of 15 lb. per acre.
- E. Rope off entire seeded area to prevent vehicles and pedestrians from entering area.

### 3.6 SODDING

- A. Edges of the sodded areas shall be smooth, and all sodded areas shall conform to the design cross sections and grade. At edges adjacent to curbs, paved areas, etc., top surface of earth in sod shall be 1/2 in. below adjacent hard surface.
- B. Sod shall be placed and all sodding operations completed within 72 hours following stripping from sod source bed.
- C. On slopes steeper than 2 to 1, sod shall be fastened in place with suitable wood pins or other approved methods, spaced at not less than 1 pin per square foot.

- D. Surface of completed sodded area shall be smooth. Sod shall be laid edge-to-edge, with tight-butted, staggered joints. Sod shall be carefully placed to insure that it is neither stretched or overlapped. Immediately after laying sod shall be pressed firmly into contact with sod bed by tamping or rolling, to eliminate air pockets. Following compaction, topsoil shall be used to fill all cracks, and excess soil shall be worked into grass with rakes or other suitable equipment. Sod shall not be smothered with excess fill soil.
- E. Immediately after sodding operations have been completed, entire surface shall be compacted with a cultipacker roller or other approved equipment weighing 100 to 160 lb./ft. of roller.
- F. Completed sod shall immediately be watered sufficiently to uniformly wet the soil to at least 1 in. below the bottom of sod bed.

### 3.7 MAINTENANCE

- A. Except as otherwise specified below, maintenance shall include all operations required to produce an established lawn, including but not limited to:
  - Fertilizing
  - Mowing
  - Replanting
  - Watering
  - Weeding
- B. Maintenance of seeded areas shall begin upon completion of seeding and shall continue through completion of two mowings as specified below is completed.
  - 1. Watering
    - a. Week No. 1: Provide all watering necessary to keep seed bed moist at all times. Perform watering daily or as necessary to maintain moist soil to a depth of 4 in.
    - b. Week No. 2 and until acceptance of the building, or until mowing as specified below is completed. Water as necessary to maintain adequate moisture in the upper 4 in. of soil to promote seed germination.
  - 2. Mowing
    - a. Not more than 40% of the grass leaf shall be removed during the first or subsequent mowings.
    - b. Bluegrass and other cool season grasses shall be maintained between 1-1/2 in. and 2-1/2 in.
    - c. All clippings shall be removed.
- C. Maintenance of sodded areas shall begin upon completion of sodding and shall continue a minimum of 45 days thereafter including two mowings, unless sodding is not completed until after September 15, in which case maintenance shall continue through June 15 the following year.
  - 1. Watering
    - a. Week No. 1: Provide all watering necessary for rooting of sod. Soil on sod pads shall be kept moist at all times. Perform watering daily or as necessary to maintain moist soil to a depth of 4 in. Watering shall be done during the heat of the day to prevent wilting.

- b. Week No. 2 and Subsequent Weeks: Water as necessary to maintain adequate moisture in the upper 4 in. of soil to promote deep root growth.
- 2. Mowing
  - a. Mowing shall not be attempted until the sod is firmly rooted and securely in place. Not more than 40% of the grass leaf shall be removed during the first or subsequent mowings.
  - b. Bluegrass and other cool season grasses shall be maintained between 1-1/2 in. and 2-1/2 in.
  - c. All clippings shall be removed.
  - d. After 2 mowings, the Contractor shall top dress the sod with an application of fertilizer at the rate of 1 pound of actual nitrogen per 1000 square feet.
- D. After grass has sprouted, seeded areas which fail to show a uniform stand of grass shall be replanted as often as necessary to establish an acceptable stand of grass with no visible bare spots > 4".
- E. Weeds and growth other than varieties of grass named in grass seed formula shall be removed. Removal may be accomplished by use of suitable herbicides or by physical removal, in which case top growth and roots shall both be removed, and bare spots exceeding specified limits shall be reseeded. Owner approval required prior to any application of fertilizer or herbicide.
- F. If lawn or grass is established in the fall and maintenance is required to continue into spring months, lawn and grass shall receive an application of lime and fertilizer in the spring. Lime and fertilizer shall be spread in a uniform layer over the entire lawn surface, at the following rates.

| <u>Material</u> | <u>Application Rate</u> |
|-----------------|-------------------------|
| Lime            | 100 lb./1000 sq. ft.    |
| Fertilizer      | 20 lb./1000 sq. ft.     |

- G. Remove rope barricades only after second cutting of lawns.

END OF SECTION

Section 32 93 00  
TREES, PLANTS AND GROUND COVERS

PART 1 GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the AGREEMENT AND GENERAL CONDITIONS and all Sections within DIVISION 1, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. Provide all materials and equipment, and do all work required to complete the planting, including furnishing and placing planting soil, as indicated on the Drawings and as specified.

1.3 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
1. Section 312000, EARTH MOVING; Establishment of subgrade elevation.
  2. Section 329119, LANDSCAPE GRADING.
  3. Section 329200, LAWNS AND GRASSES.

1.4 REFERENCES

- A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. All standards shall include the latest additions and amendments as of the date of advertisement for bids.

1. American National Standards Institute, Inc. (ANSI):

|       |  |
|-------|--|
| Z60.1 | American Standard for Nursery Stock<br>(Sponsor: American Nursery and Landscape Association) |
|-------|--|

|       |  |
|-------|--|
| A 300 | American National Standards for Tree Care Operations |
|-------|--|

2. American Society for Testing and Materials (ASTM):

|       |  |
|-------|--|
| C 136 | Sieve Analysis of Fine and Coarse Aggregates |
|-------|--|

|       |                                 |
|-------|---------------------------------|
| D 422 | Particle-Size Analysis of Soils |
|-------|---------------------------------|

E 11 Wire-Cloth Sieves for Testing Purposes

F 405 Corrugated Polyethylene (Pe) Tubing and Fittings

4. "Hortus Third", A Concise Dictionary of Plants Cultivated in the United States and Canada, Cornell University, L.H. Bailey Hortorium, MacMillian Publishing Co., New York, NY.

#### 1.5 SUBMITTALS

- A. Samples: The following samples shall be submitted:

| <u>Material</u> | <u>Sample Size or Quantity</u> |
|-----------------|--------------------------------|
| Mulch           | 1 lb bag stone mulch           |
| Soil separator  | 1 ft. <sup>2</sup>             |
| Planting soil   | 1 lb                           |

- B. Source for Planting Soil Mix: Submit information identifying sources for all soil components and the firm responsible for mixing of soil mixes.

1. Landscape Architect shall have the right to reject any soil source provider. Soil components and blends must be approved in writing prior to delivery to site.

- C. Test Reports: Test reports from an approved testing agency indicating compliance with the specifications shall be submitted for planting soils and any other materials designated by the Architect. (UMass extension school soil analysis report is acceptable) The report shall identify, but not be limited to the following information:

Soil pH  
Macro/micro nutrients  
Aluminum  
Lead  
Cation Exchange  
Organic Composition  
Soil physical composition:  
Organics  
Coarse Sand  
Loam  
Clay  
Silt

- D. Planting soil shall fall within the acceptable ranges for planting loam composition and nutrients as identified by the UMass extension school. If planting soil does not fall within these standards the contractor shall continue to source material until an acceptable soil is found.

1.6 OWNER'S INSPECTION AND TESTING

- A. Work will be subject to inspection at all times by the Architect. The Owner reserves the right to engage an independent testing laboratory in accordance with requirements of Section 014000, QUALITY REQUIREMENTS to analyze and test materials used in the construction of the work. Where directed by the Architect, the testing laboratory will make material analyses and will report to the Architect whether materials conform to the requirements of this specification.
1. Cost of tests and material analyses made by the testing laboratory will be borne by the Contractor..
  2. Testing equipment will be provided by and tests performed by the testing laboratory.

1.7 CONTRACTOR'S INSPECTION AND TESTING

- A. The Contractor shall engage an independent testing agency, experienced in the testing of agricultural/manufactured soils and acceptable to the Architect, to perform the topsoil/planting soil tests and analyses specified herein. All costs associated with testing shall be the Contractor's responsibility.

1. Particle size analysis shall include the following gradient of mineral

| content: <u>USDA Designation</u> | <u>Size in mm</u> |
|----------------------------------|-------------------|
| Gravel                           | + 2 mm Very       |
| coarse sand                      | 1-2 mm            |
| Coarse sand                      | 0.5-1 mm          |
| Medium sand                      | 0.25-0.5 mm       |
| Fine sand                        | 0.1-0.25 mm       |
| Very fine sand                   | 0.05-0.1 mm       |
| Silt                             | 0.002-0.05 mm     |
| Clay                             | < 0.002 mm        |

2. Chemical analysis shall include the following:
  - a. pH and buffer pH
  - b. percentage of organic content by oven-dried weight
  - c. Nutrient levels by parts per million, including phosphorus, potassium, magnesium, manganese, iron, zinc, and calcium. Nutrient test shall include testing laboratory recommendations for supplemental additions to the soil, if necessary, based on the requirements for ornamental horticultural plants. Recommendations shall include rates at which additives are to be applied.
  - d. Soluble salt by electrical conductivity of a 1:2 soil/water sample.

1.8 SOURCE QUALITY CONTROL

- A. Identification of plant materials shall be as named in "Hortus Third".
- B. Selection of Plant Materials: Contractor shall submit to Architect a complete list of

all proposed nurseries including location, contact #, plant list for each nursery, all proposed substitutions, credits and/or additional charges. No tagging will occur until this list is complete and submitted. Contractor shall be responsible for delays if list is not submitted complete and in advance of proposed tagging dates.

1. Inspect all nursery materials to determine that the materials meet the requirements of this section. Proposed materials shall be flagged by the nurseries for review by the Contractor and the Architect.
2. Schedule with the Architect a time for viewing plant material at the nursery. Trips to nurseries shall be efficiently arranged to allow Architect to maximize viewing time. A minimum of six weeks shall be allowed for this viewing prior to time that plants are to be dug.
3. Architect may choose to attach seal to each plant, or representative samples.
4. Viewing and/or sealing of plant materials by the Architect at the nursery does not preclude the Architect's right to reject material at the site of planting.
5. Architect will provide a maximum of two (2) tagging trips within 2.5 hour drive from Boston, MA.

- C. Plant Photographs: For any plants not tagged by Landscape Architect contractor is to provide color photographs in digital format of each required species and size of plant material as it will be furnished for the Project. Take photographs from an angle depicting true size and condition of the plant to be provided. Include a scale rod or other measuring device in each photograph. Include a minimum of three photographs showing best plant quality and worst plant quality for each species to be furnished. Clearly identify photographs with botanical name, size and source nursery.

## 1.9 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted successful establishment of plants. Installer shall provide evidence of the following credentials:
1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
  2. Experience: Five years' experience in landscape installation in addition to requirements in Division 01 General Requirements."
  3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
  4. 3 projects similar scale (within 10% of SF of proposed project) within last 5 years
  5. 3 references with phone numbers
  6. 3 photos each for each reference project
  7. Positive responses from all references
  8. Reference project review by Architect and Owner within New England area
  9. Proof of no current or past litigation over project work.
- B. Pesticide Applicator: State licensed, commercial.
- C. Soil-Testing: Testing Agencies: The following firms are acceptable testing agencies for the various components.



- a. Leaf Yard Waste Compost Stability Test and Pathogens/ Metals/ Vector Attraction: Woods End Research Laboratory, P.O. Box 297, Mt. Vernon, ME, 04352, tel: 201.293.2457, fax: 201.293.2488.
  - b. Leaf Yard Waste Compost/ All other tests except those listed above: University of Massachusetts, West Experiment Station, Amherst, MA 01003, tel: 413.545.2311, fax: 413.545.1931.
  - c. Mechanical Gradation and Chemical Analysis, All Components and Soil Mixes: University of Massachusetts, West Experiment Station, Amherst, MA 01003, tel: 413.545.2311, fax: 413.545.1931. or Approved Equal.
- D. Certificate/Certified Reports: Within 2 weeks of placement, contractor shall submit certification that the planting soil meets the requirements and is acceptable to the Environmental regulations of Massachusetts.
- E. Submit certified reports for the following data for all proposed blended planting soils:
- a. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System. Percent clay (0.002 mm) shall be reported separately in addition to silt (ASTM D-422-63, hydrometer method).
  - b. The silt and clay content shall be determined by a Hydrometer Test of soil passing the #270 sieve.
  - c. Chemical analysis shall be undertaken for Phosphorus, Potassium, Calcium Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH. Recommendations for pH adjustments and fertilizer soil amendments shall be included with all test reports.
  - d. Certified reports on analyses from producers of composted organic materials are required, particularly when sources are changed. Analyses will include all tests for criteria specified in 2.2C.
  - e. Density Tests: In-place density testing is required in all areas. Placed planting soils must be inspected for compaction level by the soil scientist or by the following: ASTM D1556 Density of Soil and Rock In Place Using Sand Cone Method, ASTM D6938-10 Nuclear Methods or ASTM D2167-08 Rubber Balloon method after conducting ASTM D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort. In-place density tests shall be carried out at a rate of one test per 1,000 square feet for each type of material placed.
  - f. Allow sufficient time to obtain all blended soil test approval and obtain the maximum dry density and optimum moisture content by ASTM 698 Standard Proctor Test.
- E. In-place percolation tests shall be performed using Turf-Tec IN2-W Infitrometer utilizing manufacturer's operating instructions. Turf-Tech IN2-W Infiltrimeter as manufactured by Turf Tec International, 1471 Capital Circle NW, Suite #13, Tallahassee, FL 32303. Order Line 800-258-7477, Phone 850-580-4026, Fax 850-580-4027.
- a. In-place infiltration tests shall be carried out at a rate of one test per each 1,000 square feet in lawn areas and planting beds.

#### 1.10 PLANT MATERIAL QUANTITIES

- A. In the event of a discrepancy in plant material quantities between the Drawings and the Plant List(s), the larger quantity shall be required.

1.11 UNAVAILABILITY OF PLANT MATERIALS

- A. Before changes or substitutions can be made due to unavailability of plant material, submit satisfactory evidence that the Contractor has advertised for a one month period in a trade journal such as the "American Nurseryman", (Tel. 312-427-7339 and Fax: 312-427-7346), with no response, or has undertaken other methods of locating plant material acceptable to the Architect. No planting substitutions are allowed without written approval of Landscape Architect.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Transportation of Plant Material: Plants transported to the project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury to the plants. Closed vehicles shall be adequately ventilated to prevent overheating of the plants. Trees shall not be transported when daytime air temperatures are below 20°.
  - 1. Plants shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the plants are in transit, being handled, or are in temporary storage.
  - 2. Unless otherwise authorized by the Architect, notify the Architect at least five working days in advance of the anticipated delivery date of any plant material. A legible copy of the bill of lading, showing the quantities, kinds, and sizes of materials included for each shipment shall be furnished to the Architect, if requested.
- B. Storage: Unless specific authorization is obtained from the Architect, unprotected plants shall not remain on the site of work longer than three days prior to being planted.
  - 1. Plants that are not planted immediately shall be protected as follows:
    - a. Earth balls shall be kept moist, not be allowed to freeze, and their solidity carefully preserved.
  - 2. Both the duration and method of storage of plant materials shall be subject to the approval of the Architect.
- C. Handling of Plant Materials: Exercise care in handling plant materials to avoid damage or stress.

1.13 REJECTION OF MATERIALS

- A. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage, shall be cause for rejection.
- B. Upon arrival at the temporary storage location or the site of the work, plants shall be inspected for proper shipping procedures. Plants with roots dried out, large branches broken, balls of earth broken or loosened, or areas of bark torn shall be subject to rejection by the Architect.
- C. Rejected plants shall be removed from the area of work and replaced with same species of the required size and quality.

- D. Architect may reject plants on site if they do not meet quality requirements and/or form represented in photo submittals.

#### 1.14 DIGGING/PLANTING SEASONS

- A. Spring Digging: Spring digging of plant materials may commence as soon as the ground has thawed and weather conditions make it practicable to dig at the nursery.
  - 1. Deciduous plants shall not be dug after they have leafed out.
  - 2. Broadleaf evergreens and conifers shall not be dug after new growth or candle push is visible.
- B. Fall Digging: Fall digging of plant materials may commence after dormancy has begun and shall continue until such time as the ground has frozen or weather conditions make it impractical to work.
  - 1. Fall digging hazards shall conform to American National Standards Institute, Inc. (ANSI) species and guidelines.
- B. Planting Seasons: Planting shall only be performed when weather and soil conditions are suitable for planting the material specified, in accordance with locally accepted practice, approval of the Architect, and to maintain the Contractor's guarantee.

#### 1.15 ACCEPTANCE FOR SUBSTANTIAL COMPLETION

- A. The Architect shall inspect all work of this Section for Acceptance for Substantial Completion upon receipt of written notice of completion by the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.
- B. Acceptance of plant material by the Architect shall be for general conformance to specified size, character, and quality, and shall not diminish responsibility for full conformance to the Contract Documents.
- C. Upon completion and reinspection of all repairs or renewals necessary in the judgement of the Architect, the Architect shall recommend that Acceptance for Substantial Completion of the work of this Section be given by the Owner.
- D. Acceptance in Part
  - 1. The work may be Accepted in parts when it is deemed to be in the Owner's best interest to do so, and when permission is given to the Contractor in writing to complete the work in parts.
  - 2. Acceptance and use of such areas by the Owner shall not waive any other provisions of this Contract.

#### 1.16 MAINTENANCE

- A. The Contractor shall maintain plant material until the completion of the guarantee period and Final Acceptance of work, as described in paragraph 3.20 of this Section.

1.17 GUARANTEE

- A. Plants shall be guaranteed for a period of one year after the date of Acceptance by the Owner.
  - 1. When the work is Accepted in parts, the guarantee periods shall extend from each of the partial Acceptances to the terminal date of the last guarantee period. Thus, all guarantee periods terminate at one time.
- B. Plants shall be healthy, free of pests and disease, and in flourishing condition at the end of the guarantee period. Plants shall be free of dead and dying branches and branch tips, and shall bear foliage of normal density, size, and color.
- C. Replace dead plants and all plants not in a vigorous, thriving condition, as determined by the Architect during and at the end of the guarantee period, without cost to the Owner, as soon as weather conditions permit and within the specified planting period.
  - 1. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this Specification.
  - 2. Make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the Owner.
  - 3. The guarantee of all replacement plants shall extend for an additional one year period from the date of their Acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of the said extended guarantee period, the Owner may elect one more replacement or credit for each item.
- D. At the end of the guarantee period, and no less than five days prior to final inspection, staking and guying materials, and tree wrap and ties shall be removed from the site.

1.18 FINAL INSPECTION AND FINAL ACCEPTANCE

- A. At the end of the guarantee period, the Architect shall, upon receipt of written notice of end of guarantee period, inspect the work for Final Acceptance. Request shall be received at least ten calendar days before the anticipated date for Final Inspection.
- B. Upon completion and reinspection of full repairs or replacements necessary in the judgment of the Architect at that time, the Architect shall recommend to the Owner that Final Acceptance of the work of this Section be given.

PART 2 PRODUCTS

2.1 PLANTS

- A. Except as otherwise specified, size and grade of plant materials and their root balls shall conform to ANSI Z60.1.
- B. Plants shall have outstanding form; symmetrical, heavily branched with an even

branch distribution, densely foliated and/or budded, and a strong, straight, distinct leader where this is characteristic of species. Plants shall possess a normal balance for the species between height and spread. The Architect will be the final arbiter of acceptability of plant form.

1. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.
  2. Small Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1.
  3. Multistem Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1.
  4. Deciduous Shrubs: Form and Size: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.
  5. Coniferous Evergreens: Form and Size: Normal-quality, well-balanced, coniferous evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.
  6. Coniferous Evergreens: Form and Size: Specimen-quality, exceptionally heavy, tightly knit, symmetrically shaped coniferous evergreens.
  7. Broadleaf Evergreens: Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.
- C. Plants shall be healthy and vigorous, free of disease, insect pests and their eggs, and larvae.
- D. Plants shall have a well-developed fibrous root system.
- E. Plants shall be free of physical damage such as scrapes, broken or split branches, scars, bark abrasions, sunscalds, fresh limb cuts, disfiguring knots, or other defects.
- F. Plants shall meet the sizes indicated on the Plant List. Plants larger or smaller than specified may be used only if accepted in writing by the Architect.
- G. Where a size or caliper range is stated, at least 50% of the material shall be closer in size to the top of the range stated.
- H. Plants shall not be pruned before delivery.
- I. All trees and shrubs shall be labeled. Labels shall be durable and legible, stating the correct plant name and size in weather-resistant ink or embossed process. Labels shall be securely attached to all plants prior to delivery to the site, being careful not to restrict growth.
- J. Plants indicated as "B&B" shall be balled and burlapped.
1. Unless otherwise permitted by the Architect, plants shall be nursery grown.
  2. Plants shall be grown for at least two years under climatic conditions similar to those in the locality of the Project.
  3. Nursery grown plants shall be dug in the current planting season. No heeled in plants or plants from cold storage that were dug in the previous season shall be accepted.

K. Container grown plants shall be well rooted and established in the container in which they were grown. They shall have grown in the container for a sufficient length of time for the root system to hold the planting medium when taken from the container, but not long enough to become root bound. Container grown plants exceeding the sizes indicated in ANSI Z60.1 shall have containers which are not less than 75% of the ball sizes for comparable B&B plant material. Each container plant shall be inspected and circling roots loosened or pruned as needed.

L. Canes or Trunk(s) and Branches:

1. Very well formed and sturdy with distinct leader and no crotches that may interfere with growth of leader. Trees with included bark in crotches shall be avoided.
2. Branching well spaced and uniformly distributed both vertically and around the circumference to form a well balanced plant.
3. Scars shall be free of rot and not exceed  $\frac{1}{4}$  the diameter of the wood beneath in greatest dimension unless completely healed (except pruning scars).
4. Pruning scars clean cut leaving little or no protrusion from the trunk or branch.
5. Graft union completely healed.
6. No mechanical or pest damage.
7. No extreme succulence.
8. Evidence of adequate twig growth in the past 2-4 years, and well-formed buds.
9. Rootflare must be exposed to adequate depth and be visible.

M. Foliage:

1. Densely supplied with healthy, vigorous leaves of normal size, shape, color and texture  
(except shrubs moved bare-root or deciduous shrubs when dormant).
2. One half of the foliage should be growing on the lower  $\frac{2}{3}$  of the trunk.
3. No chlorosis.
4. No more than 5% of total foliage affected by pest or mechanical damage.

N. Root System:

1. Sturdily established and evenly distributed.
2. Container grown plants shall be well developed and hold the soil ball together when removed from the container.
3. Container grown plants shall not be excessively rootbound.

## 2.2 PLANTING SOIL

A. Material shall meet the requirements listed in this Section.

1. Existing topsoil from on-site source(s) may be used for planting loam, to the extent available, if it meets the requirements of this Section for planting soil, or if approved by the Architect.
2. If the existing topsoil does not meet requirements imported base loam should be sourced and tested to meet requirements of the project.
  - a. Imported Planting Soil shall be a naturally occurring soil formed from geologic soil forming processes without admixtures of sand or organic matter sources (composts). Planting soil, which has been contaminated

by incorporation of subsoil, shall not be acceptable for use. Planting soil as required for the work shall be free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots or other objectionable, extraneous matter or debris. Base Loam shall also be free of quack-grass rhizomes, Agropyron Repens, and the nut-like tubers of nutgrass, Cyperus Esculentus, and all other primary noxious weeds. Base Loam shall not be delivered or manufactured into soil blends while in a frozen or muddy condition. Base Loam for mixing shall conform to the following grain size distribution for material passing the #10 sieve:

| Percent Passing        |         |         |
|------------------------|---------|---------|
| U.S. Sieve Size Number | Minimum | Maximum |
| 10                     | ---     | 100     |
| 18                     | 85      | 100     |
| 35                     | 70      | 95      |
| 60                     | 50      | 85      |
| 140                    | 36      | 53      |
| 270                    | 32      | 42      |
| 0.002mm                | 3       | 6       |

- b. The ratio of the particle size for 80% passing (D<sub>80</sub>) to the particle size for 30% passing (D<sub>30</sub>) shall be 8 or less ( $D_{80}/D_{30} < 8$ ).
- c. Maximum size shall be one-inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.
- d. The organic content shall be between 4.0 and 8.0 percent by weight.
- e. pH shall be between 5.8 and 7.0.
- f. Chemical analysis shall be undertaken for Phosphorus, Potassium, Calcium Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH.

## 2.3 LIMESTONE

- A. Limestone shall be an approved agricultural limestone containing no less than 50% of total carbonates, and 25% total magnesium with a neutralizing value of at least 100%. The material shall be ground to such a fineness that 40% will pass through a No. 100 U.S. Standard Sieve, and 98% will pass through a No. 20 U.S. Standard Sieve. The lime shall be uniform in composition, dry and free flowing, and shall be delivered to the site in the original unopened containers, each bearing the manufacturer's guaranteed analysis. Any lime which becomes caked or otherwise damaged making it unsuitable for use, will be rejected.

## 2.4 ALUMINUM SULFATE

- A. Aluminum sulfate shall be unadulterated and shall be delivered in containers with the name of the material and manufacturer and net weight of contents.

## 2.5 WATER

- A. Water shall be suitable for irrigation and shall be free from ingredients harmful to plant life.

## 2.6 FERTILIZER

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency. Manufacturer's literature shall be submitted for approval.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water- insoluble nitrogen, phosphorus, and potassium in the following composition:
1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

## 2.7 LIQUID BIOLOGICAL AMENDMENTS (In lieu of fertilizer)

- A. Liquid Biological Amendments standards:
1. Desired Levels Of Organisms (Direct Microscopy)
    - 10 to 150 or more µg active bacteria /ml.
    - 150 µg to 300 or more µg total bacteria /ml compost tea<sup>2</sup> to 10 µg or more active fungi /ml.
    - 5 to 20 or more µg total fungal biomass/ml.
    - 2,000 or more protozoa 1,000 or more flagellates 1,000 or more amoebae 10 – 30 ciliates.
    - 2 to 10 BENEFICIAL nematodes/ ml (desired; typically lacking in tea)<sup>1</sup> - 5 bacterial-feeders<sup>up</sup> to 5 fungal-feeders<sup>1</sup> - 5 predatory nematodes (typically lacking in tea) No root-feeding nematodes.
  2. Minimum of 10% active bacteria and fungi
  3. Protozoa Inoculums:
    - 4,000 or more protozoa/ml. 2,500 or more flagellates, 1,500 or more amoebae
    - 10-30 ciliates.
  4. Nematode extractions:
    - 24-32 beneficial nematodes/ml. 10-12 bacterial-feeders, 7-10 fungal feeders and 7-10 predatory nematodes.
  5. Mychorrizal Spores:
    - 9 Species Endo (31,200 prop/lb).
    - 11 Species Ecto (1.5 billion prop/lb)

## 2.8 SUPERPHOSPHATE

- A. Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes, and containing not less than 20% available phosphoric acid. The superphosphate shall be delivered to the site in the original unopened containers,



each bearing the manufacturer's guaranteed analysis. Any superphosphate which becomes caked or otherwise damaged making it unsuitable for use, will be rejected.

2.9 STONE MULCH

- A. See Section 329113.16 Mulch

2.10 FUNGICIDE

- A. Fungicide shall be "Bordeaux Mix", manufactured by Hi-Yield, or approved equal.

2.11 INSECTICIDE

- A. Insecticide shall be LESCO Horticultural Oil spray, #001150, for control of insects and mites, manufactured by LESCO, Rocky River, OH 44116, or approved equal.

2.12 POST-EMERGENT HERBICIDE

- A. Herbicide shall be QuikPRO™ herbicide, formulated as a water-soluble granule and packaged in easy-measure bottles, complete weed control, manufactured by Monsanto, or approved equal.

2.13 PRE-EMERGENT HERBICIDE

- A. Herbicide shall be LESCO Ornamental Herbicide 5G, pre-emergent grassy and selected broadleaf weed control for ornamental plants, nursery stock and ground covers, #019515, manufactured by LESCO, Rocky River, OH 44116, or approved equal.

2.14 TREE WATERING STAKE

- A. Tree watering stake shall be Deep Drip Tree Watering Stake, manufactured by Green King, LLC – World Headquarters, 162 W. Boxelder Place – Suite #2, Chandler, AZ 85225; Tel: (480) 422-0251; Fax: (480) 503-2329; Email: info@deepdrip.com, or approved equal.

- 1. Stakes shall be 14 in., 24 in., or 36 in. as recommended appropriate by manufacturer for size of tree or shrub.

PART 3 EXECUTION

3.1 PREPARATION OF PLANT MATERIALS

- A. Immediately before digging and following consultation with the Architect, spray all evergreen or deciduous trees in full leaf with Transplant Biostimulant, applying an adequate film over trunks, branches, twigs and foliage and apply Transplant Biostimulant to the root ball area
- B. Dig, and ball and burlap (B&B) plants with firm, natural balls of earth, of depth and diameter not less than that recommended by the American Standard for Nursery stock. Plants moved with a ball will not be accepted if the ball is cracked or broken before or during planting operation. Remove all grass, weeds and accumulated soil

resulting from nursery cultivation from the top of the root ball prior to digging so that the original trunk flare shows on top of the root ball.

- C. Use only natural burlap and jute twine. Do not use synthetic fibers or wire to ball and burlap root balls. Wire baskets will be acceptable if removed in accordance with these specifications.
- D. All plant material in transit or temporary stored shall be covered with burlap or similar covering to keep plants from drying out.
- E. Ship and store bare root material in refrigerated trucks and storage areas. Keep roots moist and cool until time of planting.
- F. If the construction schedule requires trees over 3 ½" in caliper to be planted in the fall, that are of a species considered to be difficult to transplant in the fall, these trees shall be root pruned the previous spring in the nursery.
  - 1. The Architect will determine tree species to be root pruned.
  - 2. A trench shall be dug around the tree at the limit of the proposed root ball to a minimum depth of 24" and back-filled.
  - 3. A 3" high saucer shall be built around the tree outside the edge of the trench.
  - 4. The tree shall be guyed or braced.
  - 5. The tree shall be watered as necessary through the summer.
  - 6. When the tree is dug in the fall, the digging shall be done using methods that preserve the new root growth growing in the soft soil of the trench.
  - 7. Root pruning, when required, shall be done at no additional cost to the Owner, except for owner pre-purchased trees.

### 3.2 EXAMINATION OF SUBGRADE

- A. Examine subgrade and rough grading before planting. Alert Architect to unacceptable rough grading or subgrade conditions.

### 3.3 DECOMPACTION OF PLANTING AREAS

- A. After subgrade levels have been reached and immediately prior to placing planting soils, the entire subgrade area shall be loosened to a minimum depth of 12 inches utilizing the bucket of a backhoe or equivalent equipment.
- B. Any subgrade areas which have become heavily compacted (defined as exceeding 86% -88% compaction ASTM C698 Standard Proctor) including, but not limited to, temporary parking areas, material stockpile areas, temporary roadways, construction areas, areas shown on the plans, or areas identified by Architect shall be deep-scarified. Immediately prior to placing soils, heavily compacted areas shall be loosened to a minimum depth of 36 inches using the teeth of a backhoe or other suitable equipment. Frequency of compaction tests shall be one per 200 square feet.
- C. Using a wide-track bulldozer size D-5 or smaller, compact the scarified subgrade to 86% - 88% compaction ASTM D698 Standard Proctor. Contractor shall provide shovel dug test pits to the full depth of the mitigation, where located per the direction of the Architect, in order for the Architect to review whether the work has been done as required. Backfill the pits after the review(s).

- D. Confirm that the subgrade is at the proper elevation and that no further earthwork is required to bring the subgrade to proper elevations. Provide a written report to Architect indicating that subgrade has been placed to the required elevations, has been decompacted according to the Contract Documents and is ready for inspection at least 3 days prior to placing planting soil. Perform no work of placing and spreading planting mixes until elevations have been confirmed and written report has been accepted by the Architect.
- E. After the soils have been loosened and inspected, topsoil may be spread by using a wide track bulldozer size D-5 or smaller or may be dumped and spread with bucket of a backhoe from the edge of the loosened area. No rubber-tired equipment or heavy equipment except for small bulldozer shall pass over the subsoils (subgrade) after they have been loosened. If Contractor plans to utilize such areas for any use of heavy equipment, this should be carried out prior to beginning the process of loosening soils or filling in that area, or it shall be rescarified to meet this specification requirement.

#### 3.4 SOIL DRAINAGE/DETRIMENTAL SOILS

- A. Test drainage of five planting pits in locations as directed by the Architect. Pits shall be filled with water twice in succession. The time at which water is put into the pit for a second filling shall be noted. Architect shall then be notified of the time it takes for pit to drain completely. Planting operations shall not proceed until Architect has reviewed test drainage results.
  - 1. To test drainage, dig a whole about 1 foot deep. Fill with water and allow it to drain completely. Immediately refill the pit and measure the depth of the water with a ruler.  
15 minutes later, measure the drop in water in inches, and multiply by 4 to calculate how much water drains in an hour.
  - 2. Less than 1 inch per hour is poor drainage, indicating the site may stay wet for periods during the year. 1 to 6 inches of drainage per hour is desirable. Any subgrades with perc rates less than 1 in. per hour shall be decompacted and/or replaced as required to meet the specifications.
- B. The Contractor shall notify the Architect in writing of all soil or drainage conditions that are considered detrimental to growth of plant material. Submit proposal and cost estimate for correction of the conditions for Architect's approval before starting work.

#### 3.5 LAYOUT OF PLANTING AREAS

- A. Individual trees shall be located in the field as indicated on the Drawings for Architect's approval prior to planting. Contractor shall provide one foreman, one loader with operator and two laborers to work with Architect in the field to determine the final location and orientation of each tree prior to planting. It is anticipated that this process may take several days to complete. Contractor shall plan to have this layout crew available to work with Architect at a slow and deliberate pace in order to achieve the desired results.
- B. Individual shrubs and perennials to be planted shall be laid out in plant beds by The Contractor in ample time to allow inspection by the Architect.

3.6 PREPARATION OF SUBGRADE

- A. Subgrade shall be brought to true and uniform grade and shall be cleared of stones greater than 2 in., sticks, and other extraneous material.

3.7 PLANT PIT EXCAVATION

- A. Planting pits for trees and shrubs shall be excavated to the depth and dimensions indicated on the Drawings.
- B. Excavation shall not begin until locations are approved by the Architect.

3.8 SPREADING OF PLANTING SOIL

- A. Planting soil shall be spread in lifts not greater than 6 inches and compacted to a density between 82% and 86% Standard Proctor Maximum Dry Density in accordance with ASTM D698. The surface area of each lift, including the subgrade after it has been compressed by a backhoe, shall be scarified by raking prior to placing the next lift.
- B. Place and spread planting medium to a depth greater than required such that after settlement, finished grade shall conform to the lines, grades and elevations shown on the Drawings. Ensure proper drainage in an uninterrupted pattern free of hollows and pockets.
- C. Remove stiff clods, lumps, brush, roots, stumps, litter and other foreign material and stones over 1 inch diameter and legally dispose of off-site.
- D. Surfaces shall be graded and smoothed, eliminating all sharp breaks by rounding, scraping off bumps and ridges, and filling in holes and cuts.

3.9 PLANTING

- A. Tree, shrub, and groundcover beds shall be excavated to the depth and widths indicated on the Drawings. If the planting pit for any tree is dug too deep, soil shall be added to bring it to correct level, and the soil shall be thoroughly tamped. Walls of plant pits shall be dug so that they are sloped as shown on the Drawings, and scarified. Do not excavate compacted subgrades of adjacent pavement or structures.
- B. Plants shall be set as indicated on Drawings. Plants shall be set so that the root flare is at, or slightly above, finished grade. Plants located in poorly drained soils shall be set 2 to 4 inches above finished grade, gradually sloping between the top of the root ball and the surrounding finished grade.
- C. Plants shall be turned to the desired orientation when required by Architect.
- D. Containerized plants shall be removed from container taking care not to damage roots. The side of the root ball shall be scarified to prevent root-bound condition before positioning in planting pit.
- E. Plants shall be positioned in center of planting pits, set plumb, and rigidly braced in position until all planting soil has been tamped solidly around the balls.

- F. Pits shall be backfilled with planting soil. Soil shall be worked carefully into voids and pockets, tamping lightly every 6 in.
  - 1. When pit is two-thirds full, plants shall be watered thoroughly, and water left to soak in before proceeding.
  - 2. At this time, ropes or strings on top of balls shall be cut and shall be pulled back. Burlap or cloth wrapping shall be left intact around ball except that portions of wrap that are exposed at top of ball shall be turned under and buried. Non-biodegradable ball wrapping and support wire shall be totally removed from ball and planting pit.
  - 3. Wire baskets shall be completely cut away from sides of root ball, and removed from pit. Bottom of basket may remain.
  - 4. Remove nursery plant identification tags.
- G. Backfilling and tamping shall then be finished and a saucer formed around plant pits as indicated on the Drawings.
- H. Saucer shall be filled with water and water left to soak in. Saucer shall then be filled with water again.

#### 3.10 TREE WATERING STAKE

- A. Trees shall have 2-3 units on opposing sides or surrounding the tree base. After tree has been placed in the hole, insert 2-3 Deep Drip units vertically in the hole surrounding the tree before back-filling with soil. Stake size shall be as recommended by manufacturer. The top of Deep Drip can either be above ground level or below ground.
- B. When positioned in the ground, remove cap and insert end of irrigation drip line and emitter into the shaft, aligning the drip line with the slot in the cap. Re-install cap to secure drip line and stop excess debris from entering shaft.

#### 3.11 LIQUID BIOLOGICAL AMENDMENTS (In lieu of fertilizer)

- A. In all new planting areas, create injection sites made every 2 feet in a grid pattern. If the viable root zone varies from this area, adjust the pattern accordingly. Each injection site shall have a 2-inch wide diameter by 8-inch deep column that will act as leaching fields during the planting process. After the liquid and aeration injection is completed, the injection columns shall be backfilled with a custom blend of long-term granular food sources that include 25% feathermeal, 75% humate plus corresponding mycorrhizal spores.
- B. Early spring injection for both Ecto and Endo Mycorrhizal plants shall consist of 50% concentrated liquid Biological Amendment with 1/2 gallon per a 100 gallons of soluble kelp, humic acid and molasses (or fish hydrolysate).

#### 3.12 FERTILIZER APPLICATION

- A. Fertilizer, if required, shall be applied at the rates recommended by soil testing results.

3.13 FUNGICIDE

- A. Immediately after planting, all trunks of deciduous trees shall be sprayed with fungicide, applied as directed by chemical manufacturer.

3.14 PRE-EMERGENT-HERBICIDE

- A. Immediately after planting, pre-emergent herbicide shall be applied to ornamental shrub beds and around base of trees, in strict accordance with chemical manufacturer's printed instructions.

3.15 POST EMERGENT-HERBICIDE

- A. Upon the appearance of weeds within planted areas, pre-emergent herbicide shall be applied to ornamental shrub beds and around base of trees, in strict accordance with chemical manufacturer's printed instructions.

3.16 INSECTICIDE

- A. Upon the appearance of insect problems, all trunks of deciduous trees shall be sprayed with insecticide, applied as directed by chemical manufacturer.

3.17 MULCHING

- A. Mulch shall be applied as follows (entire area listed shall be mulched):

| <u>Plant Type</u> | <u>Mulch Area</u> | <u>Mulch Depth, in.</u> |
|-------------------|-------------------|-------------------------|
| Tree              | Saucer            | 2                       |
| Shrub             | Saucer or Bed     | 2                       |

Mulch shall not be allowed to cover the base of trunks.

3.18 PRUNING

- A. Each tree and shrub shall be pruned to preserve the natural character of the plant. Pruning shall be done after delivery of plants and after plants have been inspected and approved by the Architect. Pruning procedures shall be reviewed with Architect before proceeding.
- B. Pruning shall be done with clean, sharp tools. Cuts shall be made flush, leaving no stubs. No tree paint shall be used.
- C. Dead wood, suckers, and broken, weak, interfering and badly bruised branches shall be removed.

3.19 MAINTENANCE OF PLANTING

- A. Maintenance shall begin immediately after each plant is planted and shall continue until Final Acceptance.

- B. Maintenance shall consist of pruning, watering, cultivating, weeding, mulching, fertilizing, removal of dead material, repairing and replacing of tree stakes, tightening and repairing of guys, adjusting and replacing of damaged tree wrap material, resetting plants to proper grades and upright position, and furnishing and applying such sprays as are necessary to keep plantings free of insects and disease, and in a healthy growing condition.
- C. Daily watering of 1 gal./caliper inch should be delivered to the root ball of each tree during the first summer after planting. Continue through fall, reducing frequency. For trees larger than 3 inch caliper, fill saucer with 6 – 8 gallons twice per week during hot, dry weather, and once per week during cooler, wetter periods.
- D. Planting areas shall be kept free of weeds, grass, and other undesired vegetative growth.

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Section 33 10 00  
WATER UTILITIES

**PART 1 - GENERAL**

**1.1 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all SECTIONS within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of Specifications.

**1.2 DESCRIPTION OF WORK**

- A. Provide labor, materials, and equipment necessary to construct the exterior water system complete, including connections to existing pipelines and testing, all as indicated on the Drawings and as specified, including but not limited to the following:
1. Installation of ductile iron pipe, fittings, accessories, and appurtenant work, at the locations and to the lines and grades indicated on the Contract Drawings.
  2. The installation of hydrants, gate valves and boxes and concrete thrust blocks.
  3. Furnishing and installation of all materials required to connect to existing water mains, replace existing services, install new gate valves, remove existing gate valves, install corporation cocks, saddles, curb stops, service boxes, and abandoning of the existing water system (if applicable), all as shown on the Contract Drawings. All valves, 24 inches and larger shall be butterfly valves. All abandoned pipes shall be cut and capped at the main.
  4. In accordance with 528 CMR 12.00, work on the fire protection system, including hydrants and exterior underground piping, shall be performed by a Licensed Fire Protection Sprinkler Systems Contractor. The fire protection exterior underground piping will terminate at the valved tee connection to the water distribution system. The tee and valve will not be considered part of the fire protection system work.
- B. Unless otherwise indicated on the Drawings, exterior water lines shall be installed from a point 10 feet outside the building foundation walls to the potable water source
- C. Related Work: The following items are not included in this Section and will be performed under the designated Sections.
1. Section 31 20 00 – EARTH MOVING for excavation, backfill, and compaction requirements.

**1.3 SUBMITTALS**

- A. Refer to Section 01 33 00 – SUBMITTAL PROCEDURES for submittal provisions and procedures.
1. Descriptive literature showing pipe dimensions, pipe and joint materials and dimensions, and other details for each class or type of pipe or product to be furnished for this contract. All pipe furnished under the contract shall be manufactured in accordance with these Specifications.
  2. Product Data: Submit manufacturer's technical product data and installation instructions for potable water system materials and products.

3. Shop Drawings: The Contractor shall submit for review shop drawings or descriptive literature for potable water system, showing piping, fittings, couplings, valves, hydrants, materials, dimensions, restrained joint calculations, joints and other details, blocks, and anchors. All hydrants and valves furnished under the Contract shall be manufactured only in accordance with the Specifications and the approved Shop Drawings.
4. At project closeout, submit record drawings of installed potable water system piping and products, in accordance with requirements of Division 1. As-Built Drawings shall be complete and shall indicate the true measurement and location, horizontal and vertical, of all new construction. As-Built drawings shall be stamped and signed by a Massachusetts Licensed Land Surveyor or Licensed Professional Engineer. The as-built plans shall also be submitted electronically as an AutoCAD drawing file (release 2010 or higher).
5. Maintenance Data: Submit maintenance data and parts lists for water system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual in accordance with requirements of Division 1.

#### 1.4 REFERENCE STANDARDS

- A. The following standards are applicable to the work of this Section to the extent referenced herein:
  1. ASTM: American Society for Testing and Materials.
  2. ANSI: American National Standards Institute.
  3. AWWA: American Water Works Association.
  4. AASHTO: American Association of State Highway and Transportation Officials.
  5. Reference is made herein to the Commonwealth of Massachusetts, Department of Transportation (MassDOT), Formerly Massachusetts Highway Department (MHD) Standard Specifications for Highways and Bridges, latest edition, hereinafter referred to as the "Standard Specifications". All references to method of measurement, basis of payment, and payment items in the "Standard Specifications" are hereby deleted. References made to particular sections or paragraphs in the "Standard Specifications" shall include all related articles mentioned therein.
  6. MassDOT, Construction Standards, latest Edition with amendments, hereinafter referred to as the "Construction Standards."
  7. Commonwealth of Massachusetts State Plumbing Code, latest edition.
  8. Commonwealth of Massachusetts Regulations 528 CMR 12.00 Sprinkler Contractor Licensing Regulations.
  9. Worcester Water Department Regulations.

#### 1.5 EXAMINATION OF SITE AND DOCUMENTS

- A. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of a lack of knowledge of existing conditions as indicated in the Contract Documents, or obvious from observation of the site.
- B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period and formed his own conclusions as to the full requirements of the work involved.

## 1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of potable water systems materials and products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
- B. Installer's Qualifications: Firm with at least three years of successful installation experience on projects with potable water piping work similar to that required for this project.
- C. Water Purveyor Compliance: Comply with requirements of Purveyor supplying water to project, obtain required permits and inspections.

## 1.7 PROJECT CONDITIONS

- A. Site Information: Perform site inspection and survey, research utility records, and verify existing utility locations and elevations. Verify that water system piping may be installed in compliance with Contract Drawings and referenced standards.
- B. Interruption of Existing Water Distribution System: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to the requirements indicated:
  - 1. Notify Architect no fewer than two days in advance of proposed interruption of service.
  - 2. Do not proceed with interruption of service without Architect's written permission.

## 1.8 SEQUENCING AND SCHEDULING

- A. Coordinate with interior building domestic water and fire protection system piping.
- B. Coordinate with other utility work.
- C. The Contractor is responsible for developing a sequence of work to maintain existing services in operation until the new services are operational.
- D. The Contractor is responsible for coordinating and scheduling the inspection of the work by the jurisdictional authority. All permits and inspection costs and fees shall be included in the bid prices and no additional costs will be paid to the Contractor.

## PART 2 - PRODUCTS

### 2.1 DUCTILE IRON PIPE AND FITTINGS

- A. General: Provide piping materials and factory fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Engineer to comply with installation requirements. Provide pipe fittings and accessories of same materials and class as pipes with joining method, as indicated. The piping shall be manufactured by an established manufacturer of good reputation in the industry and in a permanent plant adapted to meet all the design requirements of the pipe.
  - 1. Ductile iron pipe shall be that of a manufacturer who can demonstrate at least five years of successful experience in manufacturing ductile iron pipe. The pipe shall be equipped with push on type, restrained joint, or mechanical joints, as required.
  - 2. All ductile iron water pipe shall conform to American Water Works Association (AWWA) C150 and AWWA C151.

3. The ductile iron pipe shall be Class 52 and furnished in minimum nominal 18-foot lengths, with Push-on or Mechanical Joints as manufactured by U.S. Pipe and Foundry Company, Atlantic States Cast Iron Pipe Co., Clow Corporation, or approved equal with gaskets conforming to AWWA C111 "Rubber Gasket Joints". A minimum of two brass wedges per joint shall be used to maintain conductivity and facilitate lock-on.
4. All ductile iron pipes shall be rated for a minimum operating pressure of 350 psi.
5. The exterior of ductile iron pipe shall be coated with a layer of arc-sprayed zinc per ISO 8179. The mass of the zinc applied shall be 200 g/m<sup>2</sup> of pipe surface area. A finishing layer asphaltic topcoat shall be applied to the zinc. The mean dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils. The zinc coating system shall conform to ISO 8179-1 "Ductile iron pipes-External zinc-based coating-Part 1: Metallic zinc with finishing layer. Second edition 2004-06-01."
6. The ductile iron water pipe shall be double cement lined inside and then asphalt seal coated in accordance with AWWA C104 and AWWA C151. The pipe shall be furnished along with necessary materials and equipment recommended by the manufacturer for use in joining pipe lengths and fittings.
7. All water pipe shall be encased in polyethylene film when the trench is backfilled with control density fill.
8. Fittings shall be ASTM A-536 ductile iron with mechanical joint fittings. All fittings 3 inches through 48 inches in diameter shall meet or exceed the requirements of AWWA C110. Compact fittings shall be ductile iron meeting or exceeding the requirements of AWWA C153. Fittings shall have the same lining and coating as the pipe specified above. All fittings shall be marked with the weight and shall have distinctly cast upon them the pressure rating, the manufacturer's identification, nominal diameter of openings and the number of degrees or fraction of the circle on all bends. All fittings 4 through 24 inches shall be Class 350. All fittings greater than 24 inches shall be as specified above except they shall be Class 250. Compact fittings shall only be used in sizes 4 through 24 inches. Fittings shall conform to the weights, excluding accessories, and dimension shown in the latest edition of the Handbook of Ductile Iron Pipe and come complete with all joint accessories as required. All accessories (gland, gaskets, T-bolts, and nuts) shall be in accordance with AWWA C111. All mechanical joint bolts (T-bolts) shall be Cor-Ten or equal.
9. In order to provide positive joint restraint, valve anchor tees/valves and restrained joints shall be used on fire services and on the 6-inch branch connections for hydrants.
10. Caps and plugs installed in all new work as indicated on the Contract Drawings shall be provided with a threaded corporation or bleeder valve so that air and water pressure can be relieved prior to future connection.
11. Contractor shall provide all adapters and fittings such as transition couplings, as determined in the field, necessary to complete all cross connections, whether or not specifically stated in the Contract Drawings and Specifications.
12. All pipe shall be marked with the class, thickness designation, and initials of the manufacturer.
13. If required the manufacturer shall supply the Engineer with certificates of compliance with these Specifications and certification that each piece of ductile iron pipe has been tested at the foundry with the Ball Impression Test, Ring Bending, or equal.
14. Thrust blocks shall be used at all bends and fittings as shown on the details. In addition, all bends and fittings shall be restrained with Megalug Series 1100 mechanical joint restraint. In the event that the use of thrust blocks is not practical or allowed, the Contractor shall provide an alternate method of joint restraint, at no additional cost to the owner, as approved and/or as directed by the Engineer. Restraint length calculations and restrained joint locations shall be provided by the contractor and submitted to the engineer for review. Restraint length values shall be calculated per the manufacturer's standards.

- a. Restraint for standardized mechanical joints shall be incorporated in the design of the follower gland and shall impart multiple wedging actions against the pipe, increasing its resistance as the pressure increases. The assembled joint shall maintain its flexibility after burial and shall maintain its integrity by a controlled and limited expansion of each joint during the wedging action. Restraining glands shall be manufactured of high strength ductile iron conforming to the requirements of ASTM A536, Grade 65-45-12. Wedging mechanisms shall be manufactured of ductile iron, heat treated to a hardness of 370 BHN minimum. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee head bolts conforming to the requirements of ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153 of latest revision. Twist-off nuts shall be incorporated in the design of the wedge activation screws to ensure proper torque. The mechanical joint restraining device shall have a water working pressure rating of 350 psi minimum (in sizes 4" thru 16") with a safety factor of at least 2:1 against separation when tested in a dead-end situation.
  - b. Restraint for push-on ductile iron pipe shall consist of a wedge action restraint ring on the spigot joined to a split ductile iron ring behind the bell. The restraint ring shall have individually actuated wedges that increase their resistance to pull-out as pressure or external forces increase. The restraint ring and its wedging components shall be made of minimum grade 65-45-12 ductile iron conforming to ASTM A536. The wedges shall be heat treated to a minimum hardness of 370 BHN. Torque limiting twist off nuts shall be used to ensure proper actuation of the restraining wedges. The split ring shall be made of a minimum grade of 65-45-12 ductile iron conforming to ASTM A536. The connecting tie rods that join the two rings shall be made of low alloy steel that conforms to ANSI/AWWA C111/A21.11. The assembly shall have a rated pressure with a minimum two to one safety factor of 350 PSI in the sixteen-inch size and below 250 PSI in the eighteen through thirty-six-inch sizes. Push on joints on ductile iron pipe shall be restrained with Megalug Series 1700 restraint harness.
15. Insulation shall be manufactured by Thermal Pipe Systems, Atlas Insulation, or Insulated Piping Systems Inc., or other approved manufacturer. Insulation shall be factory foamed-in-place polyurethane foam insulation having nominal thickness of 1 1/2-inch, with an in-place density of 2.5 pcf, and a "K" factor of 0.16 BTU\*in./hr.\*°F\*sq. ft. Straight joints between insulated pipe lengths and the end sections of non-insulated pipe shall be sealed with heat shrinkable wrap-around polyethylene as supplied by manufacturer and installed in field by Contractor. Insulation jacket shall be 20 gauge corrugated aluminum preformed to be fastened with stainless steel screws and bands. Jacket shall have one layer of one mil polyethylene film with a protective coat of 40-pound virgin Kraft paper to act as a moisture and galvanic corrosion barrier.
  16. Pipe for use with split couplings shall be as specified except that the ends shall not have bells or beads but shall have cast or machined shoulders or grooves as necessary for the couplings to be used and shall conform to the specifications of the manufacturer of the couplings. If split couplings are used with grooved ductile-iron pipe, the minimum pipe wall thickness shall be as follows:

| Nominal Pipe Size (In.) | Thickness Class |
|-------------------------|-----------------|
| 4-12                    | 53              |
| 14-18                   | 54              |
| 20                      | 55              |
| 24                      | 56              |

17. Pipe for use with sleeve-type couplings shall be as specified except that the ends shall be plain (without bells or beads). The ends shall be cast or machined at right angles to the axis.

**B. COUPLINGS AND ADAPTERS FOR DUCTILE IRON PIPE**

1. Sleeve type couplings for plain end pipe shall be provided with plain rubber gaskets and steel, tee head bolts with nuts. Couplings shall be Dresser style 38 or 138, furnished preassembled, as manufactured by Dresser Industries, Inc., Smith Blair, Coupling Systems, Inc., or equal.
2. Couplings or adapters as required for connecting existing pipe to new pipe or new pipe to new pipe shall be furnished as required and designed for compatibility with the pipe and operating pressures encountered. Couplings shall be Dresser Style 162 as manufactured by Dresser Industries Inc., or equal. Flanged adapters shall be Dresser Style 128, or equal. Couplings for ductile iron to cast iron pipe shall be Style 53, and for ductile iron to transite pipe shall be style 153, as manufactured by Dresser Industries, Inc., or as manufactured by Smith Blair, Coupling Systems, Inc. or equal. Transition couplings shall be Style 162 as manufactured by Dresser Industries, Inc. or approved equal.
3. Split couplings may be used for connecting gray cast iron or ductile iron. If split couplings are used with grooved ductile iron pipe, the minimum pipe wall thickness shall be as specified. Split couplings shall be made of malleable iron and shall be suitable for use with grooved-end or shouldered-end, cast iron pipe. They shall be Victaulic couplings made by the Victaulic Company of America, Elizabeth, New Jersey; Gruvagrip couplings made by Gustin-Bacon Manufacturing Company, Kansas City, Missouri; Groove couplings made by Eastern Malleable Iron Company, Pittsburgh, Pennsylvania; or equal products.
4. Flexible Couplings: Sleeve type couplings for plain end ductile iron pipe shall be provided with plain rubber gaskets and steel, track head bolts with nuts.
5. Couplings shall be furnished pre-assembled by the manufacturer.
6. Couplings shall be given a shop coat compatible with the same outside coating as the pipe specified above.
7. All couplings shall be furnished with the pipe stop removed.
8. Couplings shall be provided with gaskets of a composition suitable for exposure to the liquid within the pipe. The gaskets shall have metallic tips to provide electrical continuity through the joint.
9. The Contractor shall provide suitable filling rings where the layout of the flanged piping is such as to necessitate their use. In materials, workmanship, facing, and drilling, such rings shall conform to the 125 pound ANSI Standard. Filling rings shall be of suitable length with nonparallel faces and corresponding drilling, if necessary, to ensure correct assembly of the adjoining piping or equipment.
10. Couplings for exposed pipe shall be of steel and shall be Dresser Style 38, Smith-Blair Style 411, Baker Allsteel, or equal. The couplings shall be provided with steel bolts and nuts.
11. At the Contractor's option, flexible connections in the piping shall be sleeve-type couplings, split couplings or mechanical joint pipe as herein specified.

**C. INSPECTION, TESTS, AND ACCEPTANCE FOR DUCTILE IRON PIPE**

1. All pipe delivered to the job site shall be accompanied by test reports certifying that the pipe and fittings conform to "AWWA Standard for Ductile Iron Pipe, for Water and Other Liquids" (AWWA H3) and (AWWA C151).

2. All tests shall be made in accordance with the methods prescribed by the above mentioned AWWA Standards, and the acceptance or rejection shall be based on the test results.
3. Pipe which does not conform to the requirements of this contract shall be immediately removed and replaced by the Contractor.
4. All ductile iron pipe to be installed under this Contract may be inspected at the foundry for compliance with these Specifications by an independent testing laboratory selected by the Owner. The Contractor shall require the manufacturer's cooperation in these inspections. The cost of foundry inspection of all pipe approved for this Contract, plus the cost of the inspection of a reasonable amount of disapproved pipe, will be borne by the Owner.

D. FLANGED JOINTS FOR DUCTILE IRON PIPE

1. For flanged joints, gaskets shall be ring gaskets of rubber with cloth insertion. Gaskets twelve (12)-inches in diameter and smaller shall be 1/16-inch thick, gaskets larger than twelve (12)-inch shall be 3/32-inch thick.
2. Flanged joints shall be made with bolts, bolt studs with a nut on each end, or studs with nuts where the flange is tapped. The number and size of bolts shall conform to the same ANSI Standard as the flanges. Bolts and nuts shall, except as otherwise specified or noted on the Contract Drawings, be Grade B conforming to the ASTM Standard Specification for Carbon Steel, Externally and Internally Threaded Standard Fasteners, Designation A307. Bolts and studs shall be of the same quality as machine bolts. Flanged ductile iron pipe from 3 to 48-inches in diameter shall be classified by Underwriters Laboratories Inc. in accordance with AWWA C115.

2.2 RESILIENT WEDGE GATE VALVES

- A. Resilient wedge gate valves shall be iron body, resilient seated type. The valves shall be designed for 250 psi working pressure and 400 psi test pressure.
- B. Valves are to have O ring seals and a nonrising stem. Valves shall have a 2-inch operating nut. Valves shall open right (clockwise).
- C. Resilient gate valves shall meet the most recent version of the AWWA standard specification AWWA C509.
- D. Resilient wedge valves shall have mechanical joint ends.
- E. Valves shall be as manufactured by U.S. Pipe and Foundry Company Metroseal 250, American Flow Control Model AFC2500, or Mueller Resilient Wedge Gate Valves.
- F. Valve boxes shall be cast iron, asphalt coated, sliding, heavy pattern type, consisting of three (3) pieces; a flanged bottom piece, a flanged top piece, and a cover with two (2) lifting holes and the word "water" cast on the top. A minimum 6-inch overlap is required between sliding sections. The valve box shall be designed and constructed to prevent direct transmission of traffic loads to the pipe or valve. The inside diameter of boxes shall be at least 4 1/2 inches and lengths shall be as necessary to suit ground elevation. The top of the cover shall be flush with the top of the box rim. Box covers shall be round frame and cover.
- G. Valves shall be connected directly to valve anchor tees at all hydrant branches.

### 2.3 TAPPING SLEEVES AND VALVES

- A. Tapping sleeves shall be of ductile iron construction, meeting ASTM A536 Grade 65-45-12. Side flange seals shall be O-Ring type of round, oval or rectangular cross-section shape. Sizes 12" and smaller must be capable of working on Class ABCD pipe diameters without changing either half of sleeve. Sizes 14" and larger must be specified to which class is needed. All sleeves are to include the end joint accessories and split glands necessary to assemble sleeve to pipe. Sleeve shall be coated with asphaltic varnish in compliance with NSF-61.
- B. Tapping valves shall conform to the requirements specified above for gate valves except that all Tapping sleeves and valves shall consist of a ductile iron flanged by mechanical joint sleeves and a tapping type gate valve with one flange and one mechanical joint end. The Contractor shall be responsible for verifying the outside diameter of the pipe to be tapped.
- C. The valve shall be provided with an oversized seat to permit the use of full-size cutters. Before backfilling, all exposed portions of any bolts used to hold the two halves of the sleeves together shall be heavily coated with two coats of bituminous paint comparable to Inertol No. 66 Special Heavy. Sleeves shall be of ductile iron furnished with O-ring gaskets.
- D. Bolts on bonnet and stuffing box shall be stainless steel (316 stainless steel), stuffing boxes shall be "O" ring type as indicated. Gaskets shall cover the entire flange surface.

### 2.4 HYDRANTS

- A. General: Provide Hydrants as indicated. The Hydrants shall be manufactured by an established manufacturer of good reputation in the industry and in a permanent plant adapted to meet all the design requirements of the hydrant.
  - 1. Fire hydrants shall meet or exceed AWWA C-502, latest revision and shall comply with Factory Mutual Research Corporation and Underwriters' Laboratories UL 246 Standard and specific requirements and design standards per Kennedy Valve drawing no. 80783. Rated water working pressure shall be 200 psi, test pressure shall be 400 psi.
  - 2. The main valve closure shall be of the compression type, opening against the pressure and closing with the pressure.
  - 3. Hydrants shall be of the breakaway type: The upper barrel shall connect to the lower barrel with a breakable traffic flange and 8 bolts and nuts. This connection shall allow 360-degree rotation of the upper nozzle section.
  - 4. The main valve opening shall be 5-1/4 inch and be designed so that removal of seat, drain valve mechanism, internal rod and all working parts can be removed through top of hydrant. These parts shall be removable without disturbing the ground line joint or the nozzle section of the hydrant. The bronze seat shall be threaded into mating threads of bronze for easy field removal.
  - 5. The draining system of the hydrant shall be bronze and activated by the main stem without use of auxiliary rod, toggles, pins, etc. The drain mechanism shall be completely closed after no more than three turns of the operating nut in the opening direction. There should be a minimum of (2) inside ports and (4) drain port outlets to the exterior of the hydrant. Drain shut off to be by direct compression closure.
  - 6. The operating nut, main stem, coupling and main valve assembly shall be capable of withstanding input torque of 200 ft. lbs in opening or closing directions. There shall be an internal top housing with triple O-Rings to seal operating threads from the waterway and accommodate an anti-friction washer.



7. Fire hydrants shall have 6-inch mechanical joint inlet connections to the main, two 2 ½-inch hose connections, 180-degrees apart, and one 4 ½-inch steamer connection. The hose and steamer connections shall have National Standard Thread. The standpipe shall have an 8 ½-inch minimum diameter. All nozzle caps shall be cast iron and shall be secured to the hydrant barrel with chains.
8. Hydrant shall be marked with an arrow and the word "open" to indicate the direction to turn the stem to open the hydrant. Hydrants shall open to the right (clockwise) and have a bronze operating nut that shall be pentagonal in shape, 1-1/2 inch from point to opposite flat.
9. The upper barrel shall be ductile iron with markings identifying size, model and year of manufacture. The lower barrel shall be ductile iron.
10. The hydrant shall have a minimum working pressure of 200 psi. Hydrant design shall be of positive automatic drain type to prevent freezing.
11. Hydrants shall be thoroughly cleaned and given two (2) shop or field coats of paint in accordance with AWWA C502 and the instruction of the paint manufacturer. Paint color shall be the standard hydrant color of the City of Worcester (high-visibility yellow).
12. If the hydrant is delivered with the manufacturer's standard color, the hydrant shall be given one (1) matching field coat of alkyd gloss enamel. If the hydrant is delivered with no standard color, the hydrant shall be given two (2) coats of alkyd gloss enamel according to the colors specified by the City of Worcester.
13. All exposed metal surfaces will be painted.
14. Hydrant paint shall be as manufactured by Sherman-Williams, PPG Industries, Pittsburgh, PA; Koppers Company, Inc., Pittsburgh, PA; Tnemec Company, Inc. Kansas City, MO; or approved equal.
15. Alkyd gloss enamel shall be Series 54-300 by PPG; Glamortex by Koppers; 2H-Tnemec by Tnemec or approved equal.
16. Hydrants shall be Kennedy Guardian K81D or equal and approved by the City of Worcester.

**B. HYDRANT SAFETY FLANGE REPAIR KIT**

1. Safety flange repair kits shall come complete with stem coupling, safety flange, flange gasket, replacement bolts and nuts and hydrant lubricating oil.
2. Safety flange repair kits shall be compatible with hydrant furnished.

**C. HYDRANT EXTENSION KITS**

1. Extension kits shall come complete with extension barrel, extension stem, stem coupling and hardware, flange, flange gasket, 8 bolts and nuts and hydrant lubricating oil.
2. Extension kits shall be compatible with hydrant furnished.

**2.5 SERVICE TUBING, CORPORATIONS, STOPS, SADDLES, AND VALVE BOXES**

- A. Service tubing shall meet the requirements of Federal Specification WW-T 7996 and shall conform to ASTM specification B75, B68 and B88 as they apply to Type K Copper Tubing.
- B. Copper Tube Size (CTS) Polyethylene Tubing for domestic water uses shall conform to AWWA C901, ASTM D3350, and ASTM D2737 and shall have a working pressure rating of 200 psi. Tracer wire shall be attached to the tubing and connected to upstream piping of the associated water meter for the water service, as applicable.
- C. The Contractor shall furnish and install, including necessary taps and connections, corporation stops, CTS Polyethylene Tubing, curb stops and wastes.

- D. The corporation stops shall meet the most recent revision of the AWWA standard "Threads for Underground Service Line Fittings." (AWWA C800).
- E. Corporation stops shall be sized as shown on the drawings and be brass compression-type with CC thread (Mueller Brand with compression nut with set screw). Corporation stops shall open [right].
- F. Curb Stops: Curb stops shall be sized as shown on the drawings and be brass compression-type with drain (Mueller Brand with compression nut with set screw). Curb stops shall open [right].
- G. Tapping Saddles: Service connections shall be tapped with Size 2" X 8" double strap service saddles.
- H. Fittings and Boxes: Service boxes shall be cast iron. Extension service boxes of the required length and having slide-type adjustment shall be installed at all service box locations. The boxes shall have housings of sufficient size to completely cover the curb stop and shall be complete with identifying covers
- I. Service boxes shall be 2 ½" Buffalo Style, heavy cast iron, tar-coated, sliding type, consisting of three (3) pieces; a flanged bottom piece, a flanged top piece and bolted cover with the word "water" cast on the top. A minimum 6-inch overlap is required between sliding sections. The boxes lengths shall be as necessary to suit ground elevation.

## 2.6 IDENTIFICATION

- A. Detectable Underground Warning Tapes: Acid and alkali-resistant polyethylene plastic film warning tape, 6-inches wide by 4-mils minimum thickness, with continuously printed caption in black letters "CAUTION - xxxxx LINE BURIED BELOW." The text and color of the tape shall be as shown in the table below. The tape shall have a metallic core encased in a protective jacket for corrosion protection and be detectable by a metal detector when the tape is buried up to 2.5-feet deep.

| Color                         | Utility                                     |
|-------------------------------|---|
| Safety Red                    | Electric                                    |
| High Visibility Safety Yellow | Gas, Oil, Steam                             |
| Safety Alert Orange           | Telephone, Communications, Cable Television |
| Safety Precaution Blue        | Water System, Irrigation                    |
| Safety Green                  | Sanitary Sewer, Storm Sewer                 |
| White                         | Proposed Excavation                         |

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. General: Examine areas and conditions under which potable water system's materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Engineer.
- B. The Contractor is responsible for the provisions and all test requirements specified in herein. In addition, all pipe and appurtenances may be inspected at the plant for compliance with these specifications by an independent testing laboratory.

- C. All tests shall be made in accordance with the methods prescribed by the above-mentioned AWWA Standards, and the acceptance or rejection shall be based on the test results.
- D. Inspection of the pipe and appurtenances may also be made after delivery. The pipe and appurtenances shall be subject to rejections at any time on account of failure to meet any of the specifications requirements, even though samples may have been accepted as satisfactory at the place of manufacture.
- E. Pipe which does not conform to the requirements of this contract shall be immediately removed and replaced by the Contractor at no cost to the Owner.

### 3.2 HANDLING PIPE

- A. The Contractor shall take care not to damage pipe by impact, bending, compression, or abrasion during handling, and installation. Joint ends of pipe especially shall be kept clean.
- B. Pipe shall be stored above ground at a height no greater than 5-feet, and with even support for the pipe barrel.
- C. Only nylon protected slings shall be used for handling the pipe. No hooks, chains or bare cables will be permitted.
- D. Gaskets shall be shipped in cartons and stored in a clean area, away from grease, oil, heat, direct sunlight and ozone-producing electric motors.

### 3.3 INSTALLATION OF PIPE AND PIPE FITTINGS

- A. The Contractor shall provide all adapters and fittings such as transition couplings, as determined in the field, necessary to complete all cross connections, whether or not specifically stated in the Contract Drawings and Specifications.
- B. Care shall be taken in loading, transportation, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe and fittings shall be examined before placement, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Engineer or Owner's Representative.
- C. If any defective pipe is discovered after it has been placed, it shall be removed and replaced with a sound pipe in a satisfactory manner by the Contractor, at his own expense. All pipe and fittings shall be kept clean until they are used in the work, be thoroughly cleaned before placement, and when placed, shall conform to the lines and grades required. Ductile iron pipe and fittings shall be installed in accordance with requirements of AWWA Standard Specification C600 except as otherwise provided herein. A firm even bearing throughout the length of the pipe shall be constructed by compacting sand gravel borrow around the pipe and up to 18 inches above the pipe.
- D. Blocking will not be permitted.
- E. A minimum horizontal separation of ten (10) feet shall be maintained between an existing, proposed or relocated sewer and the new water main. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten-foot separation, it is permitted to install a water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located eighteen (18) inches above the top of sewer. Where the horizontal clearance is less than ten (10) feet or the vertical clearance is less than eighteen (18) inches and the sewer crosses under the water main, both water main and sewer main shall be constructed of mechanical joint cement-lined ductile iron pipe for a

distance of 10-feet on either side of the crossing. One (1) full length of water pipe shall be centered over the sewer at the crossing. If the sewer crosses over the water main, regardless of the vertical separation, both pipes shall be concrete encased for a distance of ten (10) feet to either side of the respective centerline.

- F. Provide minimum cover over piping of 5-feet below finished grade.
- G. Extend water systems from the water main located within the public way and terminate potable water piping 10-feet 0-inches from the building foundation. Provide temporary pipe plug for piping extension into building if required by construction progress.
- H. All pipes shall be sound and clean before placement. When pipe laying is not in progress, including lunchtime, the open ends of the pipe shall be temporarily closed by watertight plug or other acceptable means. Alignment shall be maintained during placement. The deflection at joints shall not exceed sixty percent of that recommended by the manufacturer. Fittings, in addition to those shown on the plans, shall be provided, if required, in crossing utilities, which may be encountered upon opening the trench. Solid sleeves shall be used only where allowed by the Engineer.
- I. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a push-on type bell shall be beveled to conform to the manufactured spigot end. Cement lining shall be inspected for damage and shall be remortared as required to ensure a continuous lining.
- J. Mechanical joint restraints shall be used for all valves, bends, hydrants and piping section less than 50 feet. The contractor shall restrain all pipe runs to the lengths indicated on the approved restrained joint calculation shop drawings.
- K. Jointing of ductile iron push on pipe and fittings shall be done in accordance with the printed recommendations of the manufacturer and as specified. The last 8 inches of the outside of the spigot end of pipe and the inside of the bell end of pipe shall be thoroughly cleaned. The joint surfaces and the gasket shall be painted with a lubricant just prior to making up the joint. The spigot end shall then be gently pushed home into the bell. The position of the gasket shall be checked to ensure that the joint has been properly made and is watertight. Care shall be taken not to exceed the manufacturer's recommended maximum deflection allowed for each joint.
  - 1. Jointing Ductile Iron Pipe (Push-On Type): Push-on joints shall be made in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe to be entered shall then be inserted in alignment with the bell of the pipe to which it is to be joined, and pushed home with a jack or by other means. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.
  - 2. Jointing Mechanical Joint Fittings: Mechanical joints at valves, fittings, and where designated shall be installed in accordance with the "Notes on Method of Installation" under ANSI Specification A 21.11 and the instructions of the manufacturer. To assemble the joints in the field, the Contractor shall thoroughly clean the joint surfaces and rubber gasket with soapy water before tightening the bolts. Bolts shall be tight to the specified torque. Under no condition shall extension wrenches or pipes over handles or ordinary ratchet wrenches be used to secure greater leverage.
- L. Installation and jointing of ductile iron pipe shall be in accordance with AWWA C600, Sections 9b and 9c, latest revision, as applicable.

- M. Service tubing shall be installed with minimum 6-inches of sand bedding and 12-inches sand cover. Service tubing shall have a minimum total cover of 5 feet.

### 3.4 INSTALLATION OF VALVES AND APPURTENANCES

#### A. Cleaning and Prime Coating Valves and Appurtenances (Except Epoxy Coated Valves)

1. Prior to shop prime coating, all surfaces of the valves and appurtenances shall be thoroughly clean, dry, and free from all mill-scale, rust, grease, dirt, paint and other foreign substances to the satisfaction of the Engineer or Owner's Representative.
2. All ferrous surfaces shall be sand-blasted or pickled according to SSPC-SP6 or SSPC-SP8, respectively.
3. All gears, bearing surfaces and other surfaces not to be painted shall be given a heavy coat of grease or other suitable rust resistant coating unless otherwise specified herein. This coating shall be maintained as required to prevent corrosion during any period of storage and installation and shall be satisfactory through the time of final acceptance.

#### B. Installation

1. All valves and appurtenances shall be installed in the location shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired before they are installed.
2. Care shall be taken to prevent damage to valves and appurtenances during handling and installation. All materials shall be carefully inspected for defects in workmanship and materials, all debris and foreign material cleaned out of valve openings, etc., and all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness. Valves and other equipment that does not operate easily, or are otherwise defective, shall be repaired or replaced.

#### C. Shop Painting Valves and Appurtenances

1. Interior and exterior surfaces of all valves which are not factory epoxy coated shall be given two coats of shop finish of an asphalt varnish conforming to AWWA C504 for Varnish Asphalt. The pipe connection openings shall be capped to prevent the entry of foreign matter prior to installation.

#### D. Buried Valves

1. Install valves as indicated with stems pointing up. Provide valve box over underground valves. Buried valves and boxes shall be set with the operating stem vertically aligned in the center of the valve box. Valves shall be set on a firm foundation and supported by tamping selected excavated material under and at the sides of the valve.

#### E. Valve Boxes

1. Valve boxes shall be installed vertically, centered over the operating nut, and if they are in the limits of the roadway or within limits where the plowing of snow will take place in the winter, the tops of the boxes shall be set  $\frac{1}{2}$ " below the top of the finished grade. In locations where these boxes are not likely to be disturbed, the tops shall be set flush with the adjoining ground. Boxes shall be adequately supported during backfilling to maintain vertical alignment.

#### F. Corporation Cocks

1. The tapping machine shall be rigidly fastened to the pipe as near the horizontal diameter as possible. The length of travel of the tap should be so established that when the stop is inserted and tightened with at 14" wrench, not more than one to three threads will be exposed on the outside. When a wet tapping machine is used, the corporation stop shall be inserted and tightened in accordance with the manufacturer's specifications.

### 3.5 INSTALLATION OF HYDRANTS

- A. Hydrants and hydrant branches shall be tested at 175 psi and chlorinated as specified in this specification.
- B. Hydrants shall be installed in conformance to AWWA C 600, Section 11, latest revision, using thrust blocks and restrained joints in accordance with the details shown on the Contract Drawings.
- C. Hydrants, as detailed on the Contract Drawings, shall be set at the locations designated by the Engineer and shall be bedded on a firm foundation. A drainage pit 2-feet 6-inches in diameter and to the limits shown on the Contract Drawings shall be filled with crushed stone and satisfactorily compacted. During backfilling, additional crushed stone shall be brought up around, and 6-inch over the drain port. Each hydrant shall be set in true vertical alignment and shall be properly braced. Thrust blocks shall be placed between the back of the hydrant inlet and undisturbed soil at the end of the trench. Hydrant shall be set upon a slab of concrete not less than 4-in thick and 15-in square.
- D. Hydrants shall be set plumb with the steamer nozzle facing the roadway and the center of the operating nut located 18-inches back from the face of curb or edge of pavement.
- E. Hydrants shall be set such that the bottom of the breakaway feature shall be a minimum of 2-inches and a maximum of 4-inches above finish grade.
- F. Once installed, hydrants shall be painted once again by the Contractor. Hydrants shall be painted in accordance with the Owner's requirements.
- G. All ironwork to be set below ground, after being thoroughly cleaned, shall be painted with two coats of asphalt varnish as specified in AWWA C502, latest revision and ironwork to be left above ground shall be shop painted with two coats of paint.
- H. Thrust Blocks: Concrete thrust blocks shall be placed between the back of the hydrant inlet and undisturbed soil at the end of the trench. Minimum bearing area shall be as shown on the Contract Drawings. Felt paper shall be placed as shown on the Contract Drawings. Care must be taken to ensure that concrete does not plug the drain ports.

### 3.6 BACKFILLING

- A. General: Conduct excavation and backfill operations for utility installations in accordance with Section 312000 – EARTH MOVING, local requirements, and the contract documents.
- B. Initial backfill shall be placed evenly on both sides of the pipe to distribute the load and not to cause movement or deflection of the pipe.

### 3.7 FIELD QUALITY CONTROL

- A. Testing of Water Main/Service:

1. Prior to pressure testing, the entire line shall be water jetted to remove any rocks or debris that may have inadvertently entered the pipe during construction.
2. The Contractor in accordance with AWWA C651-99 specifications or latest revision will make pressure and leakage tests thereof, to determine that the ductile iron pipe is structurally safe and free of excess leakage. Pipeline shall be subject to a hydrostatic test of 150 pounds per square inch (psi) or 150% of the static pressure, whichever is greater. The Contractor shall furnish all equipment, materials, and labor for testing. Testing shall be done between valved off sections in approximately 1000-foot maximum section of the main. The Contractor shall furnish at his own expense the water needed for all water main testing.
3. Once the pipeline section has been filled at normal pressure and all entrapped air removed from the line, the Contractor shall raise the pressure to the approved test pressure by a special pressure pump taking water from a small tank of proper dimensions for satisfactorily measuring the rate of pumpage into the pipeline. The pipe shall maintain this pressure, within 5 psi, for a minimum of two hours during which time the line shall be checked for leaks. The measured water leakage shall not exceed the maximum allowed leakage as determined by the following equation for the section under test:

$$L = SDP^{1/2} / (133,200)$$

Where:

L = Allowable leakage, gallons per hour

S = Length of pipe section tested, feet  
(1,000-foot maximum)

D = Nominal pipe diameter, inches.

P = Average test pressure (psi)

Should leakage exceed this rate, the Contractor shall immediately locate the leak or leaks and repair same at his expense. Pipe shall be flushed and chlorinated when leakage does not exceed above standard. Approval does not absolve the Contractor from his responsibility if leaks develop within the new main or water services (to curb box) later within the period of warranty.

B. Testing of Fire Protection Service:

1. Testing of fire protection services shall conform to the most current NFPA requirements.

C. Chlorinating and Flushing:

1. Prior to chlorination, the Contractor shall properly flush mains. In general, flushing shall be performed at a flow rate required to achieve a minimum velocity of 2.5-feet per second (approximately 900 GPM in a 12-inch diameter main and 400 GPM in 8-inch diameter main). Flushing shall be performed for a sufficient period of time to allow for a minimum of 3 volume changes of water in the main (approximately 20 minutes per 1,000-foot of 8-inch main at the above flow rate).
2. Chlorinating shall be accomplished by pumping a chlorine solution into the mains. Water shall be allowed to enter the new water mains until the mains are full of a solution containing 25-ppm available chlorine. The valves shall then be closed and the chlorinated water allowed to stay in the mains for 24 hours. At the end of this period, the chlorine residual shall be at least 10 mg/l. If it is less than 10 mg/l measured, Contractor shall flush and rechlorinate the mains at no cost to the Owner. All valves and hydrants shall be operated to ensure their proper disinfection and shall be manipulated

to prevent super chlorinated water from entering the existing distribution system. After this period, the Contractor shall flush the mains until clear, clean water is being discharged.

3. Chlorinating and flushing shall be done in accordance with AWWA C651-99 Specifications.
4. Twenty-four hours after the main has been flushed with chlorinated water, bacteriological samples shall be taken. Water samples shall be taken from corporation stops along the length of the water main. A minimum of two (2) samples shall be taken, per 3,000-foot of pipe or on each street, whichever is greater, each in duplicate, in sterile bottles and sent to a State-approved private laboratory for analyses. The Contractor shall perform all necessary work including delivery of samples to a certified laboratory, and shall include the cost of sampling and analysis in his bid price. The results of the tests on these samples will determine the acceptance of the work and allow these new mains to be connected to the District's system. The failure of any sample to pass the laboratory tests shall require the Contractor to reflush and rechlorinate the mains and resample and test the water until acceptable results are obtained, all at no additional cost to the Owner.
5. The Contractor shall submit a Disinfection report detailing the following:
  - a. Type and form of disinfectant used.
  - b. Date and time of disinfectant injection start and time of completion.
  - c. Test locations.
  - d. Initial and 24-hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
  - e. Date and time of flushing start and completion.
  - f. Disinfectant residual after flushing in ppm for each outlet tested.
6. The Contractor shall submit a Bacteriological Report detailing the following:
  - a. Date issued, project name, and testing laboratory name, address, and telephone number.
  - b. Time and date of water sample collection.
  - c. Name of person collecting samples.
  - d. Test locations.
  - e. Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
  - f. Coliform bacteria test results for each outlet tested.
  - g. Certification that water conforms, or fails to conform, to bacterial standards.
7. Contractor shall note that work under this Contract shall NOT be considered completed until satisfactory installation and testing of the water mains have been completed.

### 3.8 FINAL INSPECTION

- A. Final inspection and acceptance of pipe, valves, appurtenances, and hydrants shall be made by the Owner's Representative and the utility owner having jurisdiction over the particular system. Prior to placing the systems in service, all components shall be inspected, with the Owner's Representative present, to ensure that no debris or other contaminants are present. If necessary, the Contractor shall clean and flush piping.
- B. The Contractor is responsible for coordinating and scheduling the inspection of the work by local jurisdictional authorities. No additional payment will be made for inspections and permits required in the performance of the work.



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Section 33 40 00  
STORM DRAINAGE UTILITIES

**PART 1 - GENERAL**

**1.1 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all SECTIONS within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made a part of this section of Specifications.

**1.2 DESCRIPTION OF WORK**

- A. Work Included: Provide labor, materials, and equipment necessary to construct the storm drainage system complete, including connections to existing structures and testing, as indicated on the Drawings and as specified.
- B. Unless otherwise indicated on the Drawings, building drain service lines shall be installed from a point 10 feet outside the building foundation walls to the point of disposal.
- C. Related Work: The following items are noted and included in this Section and will be performed under the designated sections:
  - 1. Section 31 20 00 – EARTH MOVING for excavation, backfill, & compaction requirements.
  - 2. Section 22 14 00 – FACILITY STORM DRAINAGE for building storm drainage piping.

**1.3 SUBMITTALS**

- A. Refer to Section 01 33 00 – SUBMITTAL PROCEDURES, for submitted provisions and procedures.
  - 1. Product Data: Submit manufacturer's technical product data and installation instructions for storm drain system materials and products.
  - 2. Submit descriptive literature for piping, fittings, couplings, and appurtenances showing pipe dimensions, pipe and joint materials and dimensions, and other details for each class or type of pipe or product to be furnished for this contract. All pipe furnished under the contract shall be manufactured in accordance with these Specifications.
  - 3. Submit shop drawings for storm drain systems, showing piping and manhole materials and sizes.
  - 4. Submit shop drawings of complete layout of detention/retention structures, including all fittings and appurtenances.
  - 5. The precast concrete structure shop drawing submittals for the manholes, catch basins, vaults, and tanks shall contain erection drawings showing connections, cast-in items, waterproofing details, lifting hooks, and production drawings showing elevations, sections, and details indicating sizes and quantities of reinforcement.
  - 6. Submit shop drawings for structure frames, grates, and covers.
  - 7. Filter fabric: Submit the manufacturer's information.
  - 8. For trench drains submit shop drawings showing a schematic plan of the entire trench drain system, listing all parts being provided with exact centerline dimensions suitable for installation. Copies of the manufacturer's recommended method of installation and assembly shall be submitted for review.

9. For water quality structures and stormwater quality filter treatment structures submit shop drawings for the structure and performance. Shop drawings shall detail the structures precast concrete components, inserts, and castings. Where an external bypass is required, the manufacturer shall provide calculations and designs for all structures, piping and any other required material applicable to the proper functioning of the system, stamped by a Professional Engineer.
10. The Contractor shall submit buoyancy calculations for storm drainage structures assuming groundwater is one (1) foot below finish grade. If buoyancy is an issue the structure(s) shall be modified to prevent uplift. All buoyancy calculations and precast concrete structure designs shall be prepared and sealed by a professional Civil Engineer licensed in the state of Massachusetts.
11. Prior to the acceptance of the storm drainage system, the Contractor shall submit to the Engineer, for review and approval, As-Built Drawings that indicate the true measurement and location, horizontal and vertical, of all new construction. As-Built drawings shall be stamped and signed by a Massachusetts Licensed Land Surveyor or Licensed Professional Engineer. The as-built plans shall also be submitted electronically as an AutoCAD drawing file (release 2010 or higher).
12. Prior to acceptance of the storm drainage system, the Contractor shall submit the results of the pipe deflection measurements and the video inspection reports.

#### 1.4 REFERENCE STANDARDS

- A. The following standards are applicable to the work of this Section to the extent referenced herein:
  1. ASTM: American Society for Testing and Materials.
  2. ANSI: American National Standards Institute.
  3. AASHTO: American Association of State Highway and Transportation Officials.
  4. Reference is made herein to the Commonwealth of Massachusetts, Department of Transportation (MassDOT), Formerly Massachusetts Highway Department (MHD) Standard Specifications for Highways and Bridges, latest edition, hereinafter referred to as the "Standard Specifications". All references to method of measurement, basis of payment, and payment items in the "Standard Specifications" are hereby deleted. References made to particular sections or paragraphs in the "Standard Specifications" shall include all related articles mentioned therein.
  5. MassDOT Construction Standards, latest Edition with amendments, hereinafter referred to as the "Construction Standards."

#### 1.5 EXAMINATION OF SITE AND DOCUMENTS

- A. It is hereby understood that the Contractor has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of a lack of knowledge of existing conditions as indicated in the Contract Documents, or obvious from observation of the site.
- B. Plans, surveys, measurements, and dimensions under which the work is to be performed are believed to be correct, but the Contractor shall have examined them for himself during the bidding period and formed his own conclusions as to the full requirements of the work involved.

1.6 QUALITY ASSURANCE

- A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to storm drain systems.
- B. Utility Compliance: Comply with the City of Worcester regulations, standards, and guidelines pertaining to storm drainage system installation and inspections.
- C. Plumbing Code Compliance: Comply with applicable portions of Massachusetts Plumbing Code and National Standard Plumbing Code, latest editions, pertaining to selection and installation of storm drain system's materials and products.
- D. Manufacturer's Qualifications: Firms regularly engaged in manufacturing of storm drain system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
- E. Installer's Qualifications: Firms with at least three years of successful installation experience on projects with storm drain work similar to that required for the project.

1.7 PROJECT CONDITIONS

- A. Site Information: Perform site inspection and survey, research utility records, and verify existing utility locations and elevations. Verify that storm drainage system structures and piping may be installed in compliance with Contract Drawings and referenced standards.
- B. Interruption of Existing Storm Drainage System: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to the requirements indicated:
  - 1. Notify Architect no fewer than two days in advance of proposed interruption of service.
  - 2. Do not proceed with interruption of service without Architect's written permission.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate with interior building storm drain system piping.
- B. Coordinate with other utility work.
- C. The Contractor is responsible for developing a sequence of work to maintain existing services in operation until the new services are operational.
- D. The Contractor is responsible for coordinating and scheduling the inspection of the work by the jurisdictional authority. All permits and inspection costs and fees shall be included in the bid prices and no additional costs will be paid to the Contractor.

**PART 2 - PRODUCTS**

2.1 PRECAST CONCRETE VAULTS AND TANKS

- A. The precast reinforced concrete vault and tank structures shall be designed by a Massachusetts Registered Professional Engineer employed by the Contractor, in accordance with the applicable sections of the following references:
  - 1. Commonwealth of Massachusetts State Building Code, latest edition.

2. American Concrete Institute, ACI 318 "Building Code Requirements for Reinforced Concrete."
  3. AASHTO, "Standard Specifications for Highway Bridges."
  4. Precast Concrete Institute, "Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products, MNL-116."
- B. The structures shall be designed for the following loads and possible combinations thereof:
1. Lateral soil pressure = 60 PCF (H), where H is the height from grade, as shown on the Contract Drawings, to the point of the structure being considered.
  2. Soil weight shall be assumed to be 120 PCF.
  3. AASHTO HS-20-44 loading.
  4. Weight of precast concrete structure.
  5. Initial handling and erection loadings, including design of galvanized lifting hooks using a safety factor = 4.0.
- C. Investigate buoyancy and soil bearing considerations assuming the groundwater elevation is one-foot below the ground surface.
- D. Concrete shall have a minimum 28-day compressive strength of 5,000 psi using Type II or III Portland cement with 8% maximum content of tricalcium aluminate, ASTM C150. A "normal dosage" of air-entraining agent shall be added to the concrete during the mixing cycle. Reinforcement shall be deformed billet-steel ASTM A615 or 7-wire strand ASTM A416, Grade 270 (if prestressed).
- E. Dimensions and opening sizes and locations shall be as indicated on the Contract Drawings.
- F. Pipe Connections: Vault and tank structures shall have pipe openings to accept the type of pipe specified. Pipe opening shall be minimum size required to receive the pipe and shall be accurately set to conform to the required line and grade. Sewer pipe shall be joined to the wall of the concrete structure with flexible pipe sleeves as indicated on the drawings. Flexible pipe sleeves shall be cast in the walls of the structure during the manufacturing process. Flexible pipe sleeves shall be NPC Kor-N-Seal Pipe-to-Manhole Connector as manufactured by Trelleborg Pipe Seals Milford, Inc., Milford, NH; Z-Lok as manufactured by A-Lok Products, Inc., Tullytown, PA; Tylox CIB Series Cast-In Boot Connector as manufactured by Hamilton Kent, Winchester, TN; or approved equal.
- G. Bituminous Waterproofing: The exterior surfaces of precast structures shall be given two heavy coats of bituminous waterproofing material. The material shall be No. 35-J-10 Hi Building Bituminous Coating made by Mobil Chemical Company, Edison, NJ; Bitumastic Super Service Black made by Koppers Company, Inc., Pittsburgh, PA; Bitumastic 300M made by Caroline Company, St. Louis, MO; Sonoshield HLM 5000 as manufactured by BASF Corporation Building Systems, Shakopee, MN; or acceptable equivalent products. The waterproofing material shall be applied by brush or spray and in accordance with the instructions of the manufacturer. Time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.
- H. Storm Drainage Brick Masonry: Bricks shall be sound, hard, uniformly burned, regular, and uniform in shape and size. Underburned or salmon brick shall not be acceptable. Only whole brick shall be used.
1. Bricks for raising manhole and catch basin frames to finished grade shall conform to ASTM C32, Grade MS.

2. Mortar shall be in conformance with ASTM C270, Type M. The mortar shall be composed of one part Portland cement, 3-1/2 parts sand, and ¼ parts hydrated lime, by volume. Portland cement shall be ASTM C150, Type II; hydrated lime shall be Type S conforming to ASTM D207.
3. Sand shall be washed, cleaned, screened, well-graded with all particles passing a No. 4 sieve, and conform to ASTM C33.

## 2.2 MANHOLES AND CATCH BASINS

- A. General: Provide precast reinforced concrete structures as indicated and complying with ASTM C 478.
- B. Manhole Top: Precast concrete, of concentric cone, eccentric cone, or flat slab top type, as indicated in the Contract Drawings. Tops shall be designed to meet H20 loadings.
- C. Base and Riser Sections: Precast concrete, with base riser section with integral floor. Diameter, base and riser thicknesses shall be as indicated on the Contract Drawings.
- D. Cement: Type II.
- E. Concrete strength: 4,000 psi minimum.
- F. Precast concrete sections shall have tongue and groove joints.
- G. Horizontal Joints: Joints between sections of concrete structures shall be sealed with a flexible, watertight joint, made with preformed butyl rubber joint sealant conforming to ASTM C990 or with a rubber gasket joint conforming to ASTM C443. Sealants and/or gaskets shall be installed in accordance with the manufacturer's written instructions.
- H. Manhole Steps: Steps for manholes shall be non-skid raised edge-front steel reinforced polypropylene plastic type with at least 13 inches wide stepping surface. Steps shall meet the requirements of ASTM C-478 and AASHTO M-199. Steel shall be 1/2-inch grade 60 conforming to ASTM A615 encapsulated with molded copolymer polypropylene. The polypropylene shall conform to ASTM D-4101. Rungs shall protrude no more than 6 inches from the wall. The portion of the legs to be embedded in the precast section shall have fins and be tapered to ensure a secure bond. Steps shall start a foot above the shelf of the manhole floor and continued twelve inches on center spacing up through the completed height of the unit. The steps shall finish no lower than twenty-four (24)-inches below the rim elevation. Placement into precast walls shall be by a method recommended by the supplier of the precast manhole sections. Steps shall be installed per the manufacturer's specifications.
- I. Pipe Connections: Drainage structures shall have plain beveled openings to accept the type of pipe specified. Pipe openings shall be minimum size required to receive the pipe and shall be accurately set to conform to the required line and grade. Drain pipe shall be joined to the wall of the concrete manhole or catch basin with non-shrink grout or flexible manhole sleeve as indicated on the drawings. Grout mixture shall follow instructions provided by manufacturer. Flexible manhole sleeves shall be cast in the walls of the manholes during the manufacturing process. Flexible manhole sleeves shall be NPC Kor-N-Seal Pipe-to-Manhole Connector as manufactured by Trelleborg Pipe Seals Milford, Inc., Milford, NH; Z-Lok as manufactured by A-Lok Products, Inc., Tullytown, PA; Tylox CIB Series Cast-In Boot Connector as manufactured by Hamilton Kent, Winchester, TN; or approved equal.

- J. Drain manholes shall be constructed with drop connections when the proposed invert of the connection is at least 2.75 feet above the manhole invert. All drop manholes will be of the external type. The drop pipe shall be constructed of minimum SDR 35 PVC. The drop piping and horizontal cleanout sections will be sized the same as the drain main piping and shall enter the manhole at invert elevation. The drop portion of the piping shall be secured with anchor straps. The drop piping shall be encased with control density fill.
- K. Storm Drainage Brick Masonry: Bricks shall be sound, hard, uniformly burned, regular, and uniform in shape and size. Underburned or salmon brick shall not be acceptable. Only whole brick shall be used.
  - 1. Bricks for channels and shelves shall conform to ASTM C32, Grade SS except that the mean of five tests for absorptions shall not exceed 8 percent and no individual brick exceed 11 percent.
  - 2. Bricks for raising manhole and catch basin frames to finished grade shall conform to ASTM C32, Grade MS.
  - 3. Mortar shall be in conformance with ASTM C270, Type M. The mortar shall be composed of one part Portland cement, 3-1/2 parts sand, and ¼ parts hydrated lime, by volume. Portland cement shall be ASTM C150, Type II; hydrated lime shall be Type S conforming to ASTM D207.
  - 4. Sand shall be washed, cleaned, screened, well-graded with all particles passing a No. 4 sieve, and conform to ASTM C33.
- L. In drain manholes, the invert channel within the structure shall be an inverted arch with bricks laid as stretchers and on edge and so constructed as to conform in shape to the lower half of the pipe. The shelf in manholes shall consist of bricks laid flat and the top of the shelf shall be at the elevation of the top of the pipe, as indicated on the Contract Drawings, and shall be sloped to flow toward the channel.
- M. Inverts in drain manholes shall conform accurately to size of the adjoining pipe. Side inverts and main inverts where the direction changes shall be laid out in smooth curves of the longest possible radius which is tangent, within the manhole, to the centerline of the adjoining pipe lines.
- N. For all manhole depths greater than 10 feet, the inside diameter of the manholes shall be at least 5'-0".
- O. Safety landings will be installed inside manholes greater than 16 feet in depth.
- P. When installing manholes on existing lines and when flows cannot be diverted, drop-over manholes shall be used. Drop-over manholes shall be precast with opening cast in the sidewalls of sufficient size to fit over the existing line(s) to remain in service. Drop-over manholes shall be set on a precast or cast-in-place concrete base slab. Drop-over manholes shall be manufactured to the same requirements and dimensions as standard manholes.

## 2.3 CONCRETE BLOCK MANHOLES

- A. Concrete block manholes shall only be utilized when it is not feasible to utilize a precast concrete manhole and then only with written approval from the Owner's Representative.
- B. Concrete block drain manholes shall be minimum 48 inches inside diameter and built of standard solid manhole barrel blocks set on a concrete or precast sectional plate base. The upper 2 feet of masonry shall be built using batter blocks. All joint spaces shall be completely filled, horizontal and vertical. All block to be thoroughly wet before jointing. A leveling course



of two bricks at the top shall be used to meet proper grade. Cement concrete blocks shall be machine-made solid segments conforming to the requirements for Concrete Masonry Units for Construction of Catch Basin and Manholes, ASTM-C-139. Blocks shall be 6 inches in width with the inside and outside surfaces curved to the necessary radius and so designed that the interior surfaces of the structures shall be cylindrical. The top batter courses shall be designed to reduce uniformly the inside section of the structure to the top size and shape. The blocks used in the top courses shall be designed to produce a surface 8 inches in width upon which to seat the frame.

#### 2.4 MANHOLE FRAMES AND COVERS

- A. Manhole frames and covers shall be of cast iron conforming to the requirements of AASHTO M306 and shall be manufactured by East Jordan Iron Works, Inc. (EJIW), LebBron Foundry, or approved equal. Manhole frames and covers shall be equal to EJIW 1056Z frame and EJIW 1056A cover or LeBaron LC239/L23C-1. Manhole covers shall be supplied with a closed pick hole and shall show the working "Worcester, A Town June 14, 1722: A City February 29, 1848" cast into said cover. Frames and covers shall be designed to accept H20 loads. Frame height shall be 8 inches.

#### 2.5 CATCH BASIN FRAMES AND GRATES

- A. Catch basin frames and grates shall be of cast iron conforming to the requirements of AASHTO M306 and shall be manufactured by East Jordan Iron Works, Inc. (EJIW), LeBaron Foundry, or approved equal. Catch basin grates shall be EJIW 7288M or LeBaron L28SG1. Catch basin frames shall be EJIW 7288Z (4-flange), EJIW 7288Z1 (3-flange), or LeBaron LF288, Type E. Frames and grates shall be designed to accept H20 loads. Frame height shall be 8 inches.

#### 2.6 CATCH BASIN HOODS

- A. All catch basin hoods shall be City of Worcester standard 8-inch green traps as supplied by Tolman Manufacturing Company of Boston, MA, or approved equal. Outlet pipes from catch basin hoods shall be 8-inch DR18, Class 150 PVC pipe.

#### 2.7 AREA DRAIN

- A. Area drains required for this contract shall be manufactured from PVC pipe stock, utilizing a thermo-molding process to reform the pipe stock to the specified configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. This joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals conforming to ASTM F477. The pipe bell spigot shall be joined to the main body of the area drain. A PVC cap shall be installed at the bottom of the area drain sump. The raw material used to manufacture the pipe stock that is used to manufacture the main body and pipe stubs of the surface drainage inlets shall conform to ASTM D1784 cell class 12454. Area drains shall be manufactured by Nyloplast or approved equal.
- B. Grates and frames furnished for all area drainage shall be ductile iron for sizes 8", 10", 12", 15", 18" and 24" and shall be made specifically for each basin so as to provide a round bottom flange that closely matches the diameter of the surface drainage inlet. Grates for area drains shall be capable of supporting H-20 wheel loading for vehicular traffic areas or H-10 loading for pedestrian traffic areas unless otherwise noted. 12" and 15" square grates shall be hinged to the frame using pins. Metal used in the manufacture of the castings shall conform to ASTM A536 grade 70-50-05 for ductile iron. Grates shall be provided painted

black. Grates in walkways shall meet ADA requirements. Grates in planting beds shall be domed grates. The grates furnished for area drains bioretention areas shall be 24" in diameter. Area drain grates shall be manufactured by Nyloplast or approved equal.

## 2.8 INLINE DRAINS

- A. The inline drain required for this contract shall be manufactured from PVC pipe stock, utilizing a thermos-molding process to reform the pipe stock to the furnished configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. This joint tightness shall conform to ASTM D3212 for joints for drain and sewer plastic pipe using flexible elastomeric seals. The flexible elastomeric seals shall conform to ASTM F477. The pipe bell spigot shall be joined to the inline drain body by use of a swage mechanical joint. The ram material used to manufacture the pipe stock that is used to manufacture the inline drain body and pipe stubs of the surface drainage inlets shall conform to ASTM D1784 cell class 12454.
- B. The grates furnished for all surface drainage inlets shall be ductile iron grates for sizes 8", 10", 12", 15", 18", and 30" shall be made specifically for each fitting so as to provide a round bottom flange that closely matches the diameter of the surface drainage inlet. Grates for inline drains shall be capable of supporting H-20 wheel loading for traffic areas or H-10 loading for pedestrian areas. 12" and 15" square grates will be hinged to the frame using pins. Metal used in the manufacture of the castings shall conform to ASTM A536 grade 70-50-05 for ductile iron. Grates shall be provided painted black.

## 2.9 WATER QUALITY STRUCTURE

- A. Water quality inlets and structures shall be Vortsentry HS, CDS, and/or Vortechs as manufactured by Contech Engineered Solutions, Hydroguard as manufactured by Hydroworks, Downstream Defender as manufactured by Hydro International, or equivalent. Water quality inlets shall be provided with a frame and grate. Water quality structures shall be provided with a frame and cover. Other acceptable equivalent manufactured devices may be used if following requirements are met. Prior to acceptance, the contractor shall receive written approval for use of said substitution from the City of Worcester and/or their authorized representatives.
- B. The water quality structure shall have a proven laboratory test record of having the capability to remove a minimum of 80% of the sediment load from the low-flow storm conditions from the total catchment area of the drainage system. Laboratory testing methods shall conform to the "Technology Acceptance Reciprocity Partnership" (TARP) Tier II protocol or other acceptable equivalent method and shall have the capability of removing clay and silt size particles.
- C. The available water quality structure laboratory performance documentation shall achieve a grade of "2" or better as rated through the "Massachusetts Stormwater Evaluation Project" (MAStep).
- D. The water quality structure shall be installed underground as part of the stormwater system.
- E. The structure shall be constructed of precast concrete components.
- F. Precast Concrete Sections: All precast concrete components shall be designed and manufactured to a minimum live load of AASHTO HS-20 truck loading.

- G. Joints: The concrete joints shall be watertight and meet the design criteria according to ASTM C443.
- H. Frame and Cover: The frame and cover shall clearly indicate with lettering the unit's name cast into the cover to allow for easy identification in the field.
- I. Concrete: Precast concrete components shall meet the requirements of ASTM C478.
- J. Fiberglass: The fiberglass portion of the water treatment structure shall be constructed in accordance with ASTM D409, Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks. The internal fiberglass insert shall be bolted and sealed watertight inside the reinforced concrete component.
- K. The water quality structure shall be vertically oriented with easy access to facilitate maintenance.
- L. The first 16 inches of oil storage should be lined with fiberglass or another coating acceptable to the Engineer to provide double-wall containment of any hydrocarbon-based material.
- M. Water quality structure shall be equipped with high flow bypass that shall be physically separated from the separation area to prevent mixing.
- N. The structure shall be maintainable from the surface via access points without requiring entry into the structure.
- O. The structure shall be designed to prevent the formation of secondary eddy currents or scour conditions.
- P. The structure shall be able to be installed to the invert elevations of the drainage system as detailed on the Contract Drawings.
- Q. The water quality structure shall be capable of containing floatable substances such as oil and gasoline within the structure during normal operation as well as periods of service and repair. Floatables containment shall be achieved without the use of floatable additives.
- R. The water quality structure shall not be compromised by backwater conditions i.e., trapped pollutants should not be resuspended and scoured from the interceptor during backwater conditions.
- S. Calculations stamped by a Professional Engineer shall be supplied to demonstrate that the water quality structures will accept the design flow rates without causing a backwater condition.
- T. Inspection: All precast concrete sections shall be inspected to ensure that dimensions, appearance, and quality of the product meet the requirements of ASTM C478.

## 2.10 DUCTILE IRON PIPE AND FITTINGS

- A. General: Provide pipes of the following materials of class indicated. Provide pipe fittings and accessories of same materials and class as pipes with joining method, as indicated. The piping shall be manufactured by an established manufacturer of good reputation in the industry and in a permanent plant adapted to meet all the design requirements of the pipe.

1. Ductile iron pipe shall be that of a manufacturer who can demonstrate at least five years of successful experience in manufacturing ductile iron pipe. The pipe shall be equipped with push on type, restrained joint, or mechanical joints, as required.
2. All ductile iron drain pipe shall conform to American Water Works Association (AWWA) C150 and AWWA C151.
3. The ductile iron pipe shall be Class 52 and furnished in minimum nominal 18-foot lengths, with Push-on as manufactured by U.S. Pipe and Foundry Company, Atlantic States Cast Iron Pipe Co., Clow Corporation, or approved equal with gaskets conforming to AWWA C111 "Rubber Gasket Joints".
4. Ductile iron drain pipe shall be cement-mortar lined and the pipe exterior asphalt seal coated in accordance with AWWA C104.
5. The pipe shall be furnished along with necessary materials and equipment recommended by the manufacturer for use in joining pipe lengths and fittings.
6. Fittings shall be ASTM A-536 ductile iron with mechanical joint fittings. All fittings 3 inches through 48 inches in diameter shall meet or exceed the requirements of AWWA C110. Compact fittings shall be ductile iron meeting or exceeding the requirements of AWWA C153. Fittings shall have the same lining and coating as the pipe specified above. All fittings shall be marked with the weight and shall have distinctly cast upon them the pressure rating, the manufacturer's identification, nominal diameter of openings and the number of degrees or fraction of the circle on all bends. All fittings 4 through 24 inches shall be Class 350. All fittings greater than 24 inches shall be as specified above except they shall be Class 250. Compact fittings shall only be used in sizes 4 through 24 inches. Fittings shall conform to the weights, excluding accessories, and dimension shown in the latest edition of the Handbook of Ductile Iron Pipe and come complete with all joint accessories as required. All accessories (gland, gaskets, T-bolts, and nuts) shall be in accordance with AWWA C111. All mechanical joint bolts (T-bolts) shall be Cor-Ten or equal.
7. Contractor shall provide all adapters and fittings such as transition couplings, as determined in the field, necessary to complete all cross connections, whether or not specifically stated in the Contract Drawings and Specifications.
8. All pipes shall be marked with the class, thickness designation, and initials of the manufacturer.
9. If required the manufacturer shall supply the Engineer with certificates of compliance with these Specifications and certification that each piece of ductile iron pipe has been tested at the foundry with the Ball Impression Test, Ring Bending, or equal.
10. Pipe for use with sleeve-type couplings shall be as specified except that the ends shall be plain (without bells or beads). The ends shall be cast or machined at right angles to the axis.

**B. INSPECTION, TESTS, AND ACCEPTANCE FOR DUCTILE IRON PIPE**

1. All pipe delivered to the job site shall be accompanied by test reports certifying that the pipe and fittings conform to "AWWA Standard for Ductile Iron Pipe, for Water and Other Liquids" (AWWA H3) and (AWWA C151).
2. All tests shall be made in accordance with the methods prescribed by the above mentioned AWWA Standards, and the acceptance or rejection shall be based on the test results.
3. Pipe which does not conform to the requirements of this contract shall be immediately removed and replaced by the Contractor.
4. All ductile iron pipe to be installed under this Contract may be inspected at the foundry for compliance with these Specifications by an independent testing laboratory selected by the Owner. The Contractor shall require the manufacturer's cooperation in these inspections. The cost of foundry inspection of all pipe approved for this Contract, plus

the cost of the inspection of a reasonable amount of disapproved pipe, will be borne by the Owner.

C. SLEEVE COUPLINGS FOR DUCTILE IRON PIPE

1. Sleeve couplings and accessories shall be pressure rated at least equal to that of the pipe. Couplings shall be cast iron and shall be Dresser Style 53 or 153, Rockwell Style 441, Baker Series 4245 or acceptable equivalent product. The couplings shall be provided with Cor-Ten bolts and nuts or approved equal.
2. After assembly, all exterior surfaces including the bolts and nuts shall be thoroughly coated with two coats of heavy-duty protective coating. The interior of the coupling shall be epoxy coated. Coating shall be a minimum of 10 mils. and a maximum of 20 mils. dry film thickness thermosetting epoxy.

2.11 HUB AND SPIGOT CAST IRON SOIL PIPE AND FITTINGS

- A. Hub and Spigot Cast Iron pipe and fittings shall be manufactured from gray cast iron and shall conform to ASTM A74. Joints shall be made using a compression gasket manufactured from an elastomer meeting the requirements of ASTM C564. Installation shall comply with manufacturer's recommendations and applicable code requirements.

2.12 PVC DRAINAGE PIPE

- A. General: Provide pipes of the following materials of class indicated. Provide pipe fittings and accessories of same materials and class as pipes with joining method, as indicated. The piping shall be manufactured by an established manufacturer of good reputation in the industry and in a permanent plant adapted to meet all the design requirements of the pipe.
- B. PVC (Polyvinyl Chloride) Gravity Sewer Pipe and Fittings: ASTM D3034, SDR 35, for elastomeric gasket joints. Pipe 18 to 36 inches in diameter shall conform to ASTM F679, T-1 heavy wall. The pipe shall have an SDR ratio of 35 and a pipe stiffness of 46 psi.
- C. PVC pipe for catch basin outlets shall be DR18, Class 150 PVC.
- D. Joints: PVC pipe shall have an integral wall bell and spigot push-on joint with elastomeric gaskets secured in place in the bell of the pipe. The bell shall consist of an integral wall section with solid cross-section elastomeric gasket, factory assembled, securely locked in place to prevent displacement during assembly. Pipe joints shall conform to ASTM D3212 and elastomeric gaskets shall conform to ASTM F477.
- E. Spigot pipe ends shall be supplied with bevels from the manufacturer to ensure proper insertion. Each spigot end shall have an "assembly stripe" imprinted thereon to which the bell end of the mated pipe will extend upon proper joining of the two pipes.
- F. PVC gravity sewer fittings and accessories shall be as manufactured and furnished by the pipe supplier or approved equal and have bell and spigot configurations compatible with that of the pipe.

2.13 CORRUGATED POLYETHYLENE PIPE

- A. General: Provide pipes of the following materials of class indicated. Provide pipe fittings and accessories of same materials and class as pipes with joining method, as indicated. The piping shall be manufactured by an established manufacturer of good reputation in the industry and in a permanent plant adapted to meet all the design requirements of the pipe.

1. Corrugated polyethylene pipe shall have an interior surface that is smooth and even, free from roughness, projections, indentations, offsets, or irregularities of any kind.
  - a. Pipe shall conform to AASHTO M252, Type S for 4- through 10-inch diameter pipes.
  - b. Pipe shall conform to AASHTO M294, Type S or ASTM F2306 for 12- through 60-inch diameter pipes.
  - c. Fittings shall conform to AASHTO M252, AASHTO M294 or ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the watertight joint performance requirements of AASHTO M252, AASHTO M294 or ASTM F2306.
2. Pipe and fittings shall be high-density polyethylene meeting the requirements of ASTM D3350.
3. Pipe units shall have a minimum laying length of 20-feet except as otherwise indicated or allowed by the Engineer.
4. Pipe shall be installed with a minimum 12-inch cover for AASHTO H-20 loading.

**B. CORRUGATED POLYETHYLENE FLARED END SECTION**

1. The pipe shall have an interior surface that is smooth and even, free from roughness, projections, indentations, offsets, or irregularities of any kind. Flared end section shall be high-density polyethylene meeting ASTM D3350 minimum cell classification 213320C. Metal threaded fastening rods shall be stainless steel.

**C. JOINTS ON CORRUGATED POLYETHYLENE PIPE**

1. The pipe and fitting joints shall be bell-and spigot with watertight gaskets in accordance with the requirements of ASTM D3212.
2. Gaskets shall meet the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.
3. Pipe entrances at catch basins shall be made with a mortar made with Type II cement. Mortar mixture shall follow instructions provided by cement manufacturer. Pipe connections at drain manholes and water quality structures shall be made with integral flexible rubber sleeves and Corrugated Pipe Adapters designed for use with the pipe and sleeves.

**2.14 REINFORCED CONCRETE PIPE (CLASS IV; 12 THROUGH 48 INCHES)**

- A. General: Provide pipes of the following materials of class indicated. Provide pipe fittings and accessories of same materials and class as pipes with joining method, as indicated. The piping shall be manufactured by an established manufacturer of good reputation in the industry and in a permanent plant adapted to meet all the design requirements of the pipe.
  1. The pipe shall have an interior surface, which is smooth and even, free from roughness, projections, indentations, offsets, or irregularities of any kind. Pipe shall conform to ASTM "Specifications for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe," Designation: C76 and shall be Wall B for the Class IV and V, as noted on the drawings, and with additions and exceptions as follows:
  2. Type II cement shall be used unless otherwise approved by the Engineer. Admixtures shall not be used except with prior approval of the Engineer.

3. Elliptical reinforcement will not be permitted. Longitudinal reinforcement shall be continuous. Reinforcement shall have a minimum cover of  $\frac{3}{4}$  inch. Pipe shall have no lifting holes.
4. Absorption shall be as specified under "Tests of Materials and Pipe Units."
5. Pipes manufactured by the centrifugal process or in vertical forms shall be cast of wet mix concrete. Concrete cast in vertical forms shall be consolidated by internal or external mechanical vibration or both. The vibrating equipment shall be operated at high speed (more than 5,000 rpm) and have a low amplitude. Pipes manufactured by the modified packer process shall have a supplementary concrete densification operation that shall assure the attainment of full bond between reinforcement and concrete and also eliminate any displacement of the reinforcement. Additional passes with the revolving packerhead or the use of additional vibrators attached to the platform or exterior forms will not be acceptable.
6. Pipe units shall have a minimum laying length of 8-feet except as otherwise indicated or allowed by the Engineer.
7. Pipe may be rejected for any of the following reasons:
  - a. Exposure of any wires, positioning spacers or chairs used to hold the reinforcement cage in position, or steel reinforcement in any surface of the pipe, except as permitted by Section 8.2 of ASTM C76.
  - b. Transverse reinforcing steel found to be in excess of 1/4-inch out of specified position after the pipe is molded.
  - c. Any shattering or flaking of concrete as a crack.
  - d. Voids, with the exception of a few minor bugholes, on the interior and exterior surfaces of the pipe exceeding 1/4-inch in depth, unless properly and soundly pointed with mortar or other approved material.
  - e. A hollow spot (identified by tapping the internal surface of the pipe) which is greater than 30-inches in length or wider than 3 times the specified wall thickness.
  - f. Defects that indicate imperfect molding of concrete; or any surface defect indicating honeycomb or open texture (rock pockets) greater in size than area equal to a square with a side dimension of  $2\frac{1}{2}$  times the wall thickness or deeper than two times the maximum graded aggregate size; or local deficiency of cement resulting in loosely bonded concrete.
  - g. Any of the following:
    - 1) A crack having a width of 0.005 to 0.01-inches throughout a continuous length of 36-inches or more.
    - 2) A crack having a width of 0.0 to 0.03-inches or more throughout a continuous length of 1-foot or more.
    - 3) Any crack greater than 0.005-inches extending through the wall of the pipe and having a length in excess of the wall thickness.
    - 4) Any crack showing two visible lines of separation for a continuous length 2-feet or more, or an interrupted length of 3-feet or more anywhere in evidence, both inside and outside.
    - 5) Cracks anywhere greater than 0.03-inches in width.
  - h. Application of any wash coat of cement or grout to the pipe will not be permitted without approval of the Engineer. Any pipe dressing procedures shall be subject to the approval of the Engineer.

B. Joints on Reinforced Concrete Pipe:

1. Pipe joints for all reinforced concrete pipe shall be of the rubber gasket type in which the gaskets are in compression and which will permit both longitudinal and angular movement. Each unit of pipe shall be provided with proper ends made of concrete formed true to size and formed on machined rings to ensure accurate joint surfaces.
  2. Joints and gaskets for pipe shall be the O-ring gasket type and shall conform to the requirements of ASTM C443 and the additional requirements specified.
  3. Joints shall be of such design that when tested under an average internal hydrostatic pressure of 13 pounds per square inch for a period of 10 minutes, no visible leakage will result. The diameters of the joint surfaces which compress the gasket shall not vary from the true diameters by more than 1/16-in or the amount permitted by the appropriate above-mentioned ASTM Standard Specifications, whichever is less.
  4. Gaskets shall be of a composition and texture which is resistant to common ingredients of sewage, industrial wastes, and groundwater, and which will endure permanently under the conditions likely to be imposed by this service. Gaskets shall be the product of a manufacturer regularly engaged in the manufacture of rubber gaskets for pipe joints.
- C. Flared End Sections: Reinforced Concrete Pipe flared end sections shall conform to requirements of AASHTO M170, minimum Class IV.

## 2.15 FILTER FABRIC

- A. Filter Fabric used, as a drainage medium shall consist of a non-woven fabric made from polypropylene or polyethylene filaments or yarns. The fabric shall be inert to organic chemicals commonly encountered in the soil. Edges of filter fabric shall overlap a minimum of one foot. The fabric shall conform to the following recommended property tests:

| Property                    | Unit                 | Test Method     | Minimum Value |
|-----------------------------|----------------------|-----------------|---------------|
| Weight                      | oz/sy                | ASTM D-5261-92  | 4.8           |
| Grab Strength               | lbs                  | ASTM D-4632-91  | 120           |
| Grab Elongation             | percent              | ASTM D-4632-91  | 50            |
| Trapezoid Tear Strength     | lbs                  | ASTM D-4533-91  | 50            |
| Mullen Burst Strength       | psi                  | ASTM D-3786-87  | 225           |
| Puncture Strength           | lbs                  | ASTM D-4833-00  | 65            |
| Apparent Opening Size (AOS) | U.S. std. Size Sieve | ASTM D-4751-99A | 70            |

## 2.16 CRUSHED STONE

- A. Crushed stone shall consist of durable crushed rock or durable crushed gravel stone, free of ice and snow, sand, clay, loam, or other deleterious or organic material. The crushed stone shall be uniformly blended and shall conform to the following requirements.



| Percent Passing by Weight |                |                |
|---------------------------|----------------|----------------|
| Sieve Size                | 3/4-inch Stone | 1/2-inch Stone |
| 1-inch                    | 100            | ---            |
| 3/4-inch                  | 90-100         | ---            |
| 5/8-inch                  | ---            | 100            |
| 1/2-inch                  | 10-50          | 85-100         |
| 3/8-inch                  | 0-20           | 15-45          |
| No. 4                     | 0-5            | 0-15           |
| No. 8                     | ---            | 0-5            |

#### 2.17 DRAIN COUPLINGS

- A. Drain Couplings shall be pressure rated at least equal to that of the pipe. The coupling sleeve shall be 1/4-inch minimum thickness elastomeric polyvinylchloride with a minimum tensile strength of 1500 psi. The sleeve shall fit snugly onto the pipe to be joined and be resistant to common chemicals present in stormwater. Adjustable pipe clamps shall consist of a slotted band that mate with the worm gear screw and a screw housing all manufactured of stainless steel, and suitable for underground service.

#### 2.18 CLEANOUTS

- A. General: Provide cast-iron ferrule and countersunk brass cleanout plug, with round cast-iron access frame and heavy-duty, secured, scoriated cast-iron cover.
- B. The drain cleanouts shall be minimum 6-inch diameter or sized to match the service pipe, whichever is greater. The cleanout shall be complete with a flush mount over. The cleanout cover shall be clearly marked "DRAIN" and shall be minimum eight inches in diameter or two inches greater than the cleanout size, whichever is greater. Cleanouts shall include a watertight cap.

#### 2.19 IDENTIFICATION

- A. Detectable Underground Warning Tapes: Acid and alkali-resistant polyethylene plastic film warning tape, 6-inches wide by 4-mils minimum thickness, with continuously printed caption in black letters "CAUTION - xxxxx LINE BURIED BELOW." The text and color of the tape shall be as shown in the table below. The tape shall have a metallic core encased in a protective jacket for corrosion protection and be detectable by a metal detector when the tape is buried up to 2.5-feet deep.

|            |          |
|------------|----------|
| Color      | Utility  |
| Safety Red | Electric |

| Color                         | Utility                                     |
|-------------------------------|---|
| High Visibility Safety Yellow | Gas, Oil, Steam                             |
| Safety Alert Orange           | Telephone, Communications, Cable Television |
| Safety Precaution Blue        | Water System, Irrigation                    |
| Safety Green                  | Sanitary Sewer, Storm Sewer                 |
| White                         | Proposed Excavation                         |

### PART 3 – EXECUTION

#### 3.1 GENERAL INSTALLATION

- A. General: General Locations and Arrangements: Contract Drawings indicate the general location and arrangement of the underground storm drainage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical. Any modifications to the layout of the storm drainage system shall be submitted to the Engineer for review and approval at least five days prior to the start of the affected work.
- B. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's recommendations, accepted practices, and utility owner's requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- C. All pipe shall be laid in the dry. Adequate measures shall be taken to prevent floatation of pipe in the trench.
- D. Whenever encountered within the trench, existing abandoned water, sewer, and/or drain lines shall be removed within the trench limits, unless otherwise noted. The remaining portion of the abandoned lines shall be plugged at all open ends.
- E. When bell and spigot pipes are used, bell holes shall be dug in the bedding to accommodate the bells. They shall be deep enough to ensure that the bell does not bear on the bottom of the hole but shall be excessively wide in the longitudinal direction of the installation.
- F. Use manholes for changes in direction, except where a fitting is indicated. Use fittings for branch connections, except where direct tap into an existing storm drain is indicated.
- G. Use proper size increasers, reducers, and couplings, where different size or material of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited without the written approval of the Engineer.
- H. Install piping pitched down in direction of flow as indicated on the Contract Drawings.
- I. Extend storm drainage system piping to connect to building drain services, of sizes and in locations indicated on the Contract Drawings.
- J. Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.
- K. Acceptance of Pipe: Acceptance will be on the basis of tests specified herein before. The quality of all materials used in the pipe, the process of manufacture, and the finished pipe

shall be subject to review by the Engineer. Inspection may be made at the place of manufacture, or on the work site after delivery or at both places and the pipe shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though sample pipe units may have been accepted as satisfactory at the place of manufacture. All pipe which is rejected shall be immediately removed from the project site by the Contractor.

- L. Pipe Storage: Pipe sections shall not be stored on areas over the newly laid pipe or other pipelines which might be damaged by the superimposed load, and storage sections shall be restricted to approved areas.
- M. Handling Pipe: Each pipe unit shall be handled into its position in the trench only in such manner and by such means, as the Engineer accepts as satisfactory. The Contractor will be required to furnish suitable devices to permit satisfactory support of all parts of the pipe unit when it is lifted.
- N. Laying Pipe: Except where a concrete cradle or envelope is required, the pipe shall be laid in a crushed stone cradle. In trenches, no blocking or supporting of the piping by concrete, stones, bricks, wooden wedges, or method other than bedding the pipe on crushed stone will be permitted. Each length of pipe shall be shoved home against the pipe previously laid and held securely in position. Joints shall not be "pulled" or "cramped" without approval of the Engineer.
- O. Jointing Pipe: After the pipe are aligned in the trench and are ready to be jointed, all joint surfaces shall be cleaned.
- P. Alignment and Placement: All pipe shall be laid with extreme care as to grade and alignment. Each pipe shall be so laid as to form a close joint with the next adjoining pipe and bring the inverts continuously to the required grade.
  - 1. Stakeout of drain work and setting of line and grade is the responsibility of the Contractor.
  - 2. The Contractor shall establish centerline and offset stakes at each manhole, plus one intermediate centerline and offset stake as a checkpoint between manholes. Laser aligning shall not be used to establish a continuous line in excess of 400-feet.
- Q. Cleaning: Care shall be taken to prevent earth, water, and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, the Contractor shall clean out the pipeline and manholes being careful to prevent soil, water, and debris from entering any existing drainage system.
  - 1. Place plugs in end of uncompleted conduit at end of day or whenever work stops.
  - 2. Flush lines between manholes to remove collected debris.
- R. Review of Completed Storm Drain System: The completed drain system shall be visually inspected by the Owner's Representative. If the visual observation of the completed drain or any part thereof shows any pipe, manhole, or joint to be of defective work or material, the defect shall be replaced or repaired as directed by the Engineer or the Owner's Representative. The Contractor shall coordinate and provide site access for inspection.

### 3.2 PLACEMENT OF DUCTILE IRON PIPE AND FITTINGS

- A. Care shall be taken in loading, transportation, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe and fittings shall be examined before

placement, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Engineer.

- B. If any defective pipe is discovered after it has been placed, it shall be removed and replaced with a sound pipe in a satisfactory manner by the Contractor, at his own expense. All pipe and fittings shall be kept clean until they are used in the work, be thoroughly cleaned before placement, and when placed, shall conform to the lines and grades required. Ductile iron pipe and fittings shall be installed in accordance with requirements of AWWA Standard Specification C600 except as otherwise provided herein. A firm even bearing throughout the length of the pipe shall be constructed by compacting gravel borrow around the pipe and up to the springline.
  - 1. Blocking will not be permitted.
- C. All pipes shall be sound and clean before placement. When pipe laying is not in progress, including lunchtime, the open ends of the pipe shall be temporarily closed by watertight plug or other acceptable means. Alignment shall be maintained during placement. The deflection at joints shall not exceed sixty percent of that recommended by the manufacturer. Fittings, in addition to those shown on the plans, shall be provided, if required, in crossing utilities, which may be encountered upon opening the trench. Solid sleeves shall be used only where allowed by the Engineer.
- D. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a push-on type bell shall be beveled to conform to the manufactured spigot end.
- E. The Contractor shall take care not to damage pipe by impact, bending, compression, or abrasion during handling, and installation. Joint ends of pipe especially shall be kept clean.
- F. Pipe shall be stored above ground at a height no greater than 5 feet and with even support for the pipe barrel.
- G. Only nylon protected slings shall be used for handling the pipe. No hooks, chains or bare cables will be permitted.
- H. Gaskets shall be shipped in cartons and stored in a clean area, away from grease, oil, heat, direct sunlight and ozone-producing electric motors.
- I. Jointing of ductile iron push on pipe and fittings shall be done in accordance with the printed recommendations of the manufacturer and as specified. The last 8 inches of the outside of the spigot end of pipe and the inside of the bell end of pipe shall be thoroughly cleaned. The joint surfaces and the gasket shall be painted with a lubricant just prior to making up the joint. The spigot end shall then be gently pushed home into the bell. The position of the gasket shall be checked to ensure that the joint has been properly made and is watertight. Care shall be taken not to exceed the manufacturer's recommended maximum deflection allowed for each joint.
  - 1. Jointing Ductile Iron Pipe (Push-On Type): Push-on joints shall be made in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe to be entered shall then be inserted in alignment with the bell of the pipe to which it is to be joined, and pushed home with a jack or by other means. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

2. Jointing Mechanical Joint Fittings: Mechanical joints at fittings and where designated shall be installed in accordance with the "Notes on Method of Installation" under ANSI Specification A 21.11 and the instructions of the manufacturer. To assemble the joints in the field, the Contractor shall thoroughly clean the joint surfaces and rubber gasket with soapy water before tightening the bolts. Bolts shall be tight to the specified torque. Under no condition shall extension wrenches or pipes over handles or ordinary ratchet wrenches be used to secure greater leverage.
- J. Installation and jointing of ductile iron pipe shall be in accordance with AWWA C600, Sections 9b and 9c, latest revision, as applicable.
- K. Ductile iron pipe installed within 5-feet of gas lines shall be fully encased with polyethylene material. Polyethylene shall be 8 millimeters thick and comply with AWWA C 105.

### 3.3 PVC PIPE

- A. General: Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.
- B. PIPE HANDLING
  1. All pipe and fittings shall be carefully handled from the truck onto the ground and into the trench or excavation so as to prevent damage to the pipe. Pipes shall be kept free of dirt and foreign material, especially on the inside. Joint ends of pipe shall especially be kept clean.
  2. Pipe stored on site shall be protected from heat and direct sunlight and shall be suitably ventilated.
  3. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective.
- C. ALIGNMENT AND PLACEMENT OF PVC PIPE
  1. Bedding material for the pipe must be installed with care in the area around the pipe. Bedding material must be placed to provide uniform and adequate support under pipe. Do not use blocking to bring pipe up to grade.
  2. Provide bell holes at each joint to permit joint to be assembled properly while maintaining uniform pipe support.
  3. Place and consolidate the bedding material under the pipe haunch to provide adequate side support while avoiding both vertical and lateral displacement of pipe.
  4. Initial backfill must be completed to a point at least 12-inches over the top of the pipe and be hand placed. Use little or no tamping of initial backfill directly over the top of pipe. Compaction methods may be utilized during final backfilling.
  5. No length of pipe shall be laid until the proceeding lengths of pipe have been thoroughly embedded in place, to prevent movement or disturbance of the pipe alignment.
  6. Full lengths of pipe shall be used in the installation except that partial lengths may be used at the entrance to structures, and to accommodate the required locations of service connection fittings.
  7. Pipe entrances to structures shall be cut flush with the inside face of the structure, and cut ends of the pipe surface within the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges or imperfections that will impede or affect the hydraulic characteristics of the sewage flow. The method of cutting and finishing shall be subject to the approval of the Engineer.

8. The Contractor shall protect the installation at all times during construction. The movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be performed at the Contractor's own risk.
9. Drain pipes shall be laid to the required grades by use of a laser and target system, unless otherwise specifically approved by the Engineer.
10. Jointing of PVC drain pipe and fittings shall be done in accordance with the printed recommendations of the manufacturer and as specified. The bell end of the pipe shall be thoroughly cleaned. The joint surfaces and the gasket shall be lubricated prior to making up the joint. The position of the gasket shall be checked to ensure the joint has been properly made and is watertight. Care shall be taken not to exceed the manufacturer's recommended maximum deflection allowed for each joint.
11. PVC pipe shall be pushed home by hand or with the use of bar and block. The use of power equipment, such as a backhoe bucket, is not acceptable.
12. Field-cut pipe ends shall be cut square and the pipe surface beveled to the size and shape of a factory-finished beveled end. All sharp edges shall be rounded off.

#### 3.4 INSTALLATION OF REINFORCED CONCRETE PIPE AND PIPE FITTINGS

- A. General: Install piping in accordance with ASTM D2321, the governing authorities having jurisdiction over the utility, and the manufacturer's instructions, except where more stringent requirements are required by the Contract Documents.
- B. Acceptance of Pipe: Acceptance will be on the basis of tests specified hereinbefore. The quality of all materials used in the pipe, the process of manufacture, and the finished pipe shall be subject to review by the Engineer. Inspection may be made at the place of manufacture, or on the work site after delivery or at both places and the pipe shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though sample pipe units may have been accepted as satisfactory at the place of manufacture. All pipe which is rejected shall be immediately removed from the project site by the Contractor at no cost to the Owner.
- C. Pipe Storage: Pipe sections shall not be stored on areas over the newly laid pipe or other pipelines which might be damaged by the superimposed load, and storage sections shall be restricted to approved areas.
- D. Laying Pipe: Except where a concrete cradle or envelope is required, the pipe shall be laid in a crushed stone cradle. In trenches, no blocking or supporting of the piping by concrete, stones, bricks, wooden wedges, or method other than bedding the pipe on crushed stone will be permitted. Each length of pipe shall be shoved home against the pipe previously laid and held securely in position. Joints shall not be "pulled" or "cramped" without approval of the Engineer.
- E. Jointing Pipe: After the pipes are aligned in the trench and are ready to be jointed, all joint surfaces shall be cleaned.
- F. Alignment and Placement: All pipes shall be laid with extreme care as to grade and alignment. Each pipe shall be so laid as to form a close joint with the next adjoining pipe and bring the inverts continuously to the required grade.
  1. Stakeout of drain work and setting of line and grade is the responsibility of the Contractor.
  2. The Contractor shall establish centerline and offset stakes at each manhole, plus intermediate centerline and offset stakes as needed to ensure proper alignment and

grade. Laser aligning shall not be used to establish a continuous line in excess of 400-feet.

- G. Cleaning: Care shall be taken to prevent earth, water, and other materials from entering the pipeline. As soon as possible after the pipe and manholes are completed, the Contractor shall clean out the pipeline and manholes being careful to prevent soil, water, and debris from entering any existing Drain.
  - 1. Place plugs in end of uncompleted conduit at end of day, or whenever work stops.
  - 2. Flush lines between manholes to remove collected debris.
- H. Review of Completed Reinforced Concrete Pipe System: If the visual observation of the completed drain or any part thereof shows any pipe, manhole, or joint to be of defective work or material the defect shall be replaced or repaired as directed at no cost to the Owner. The visual observation shall be conducted by the Engineer and any defects shall be as identified by such. The Contractor shall coordinate and provide site access for the Owner.

### 3.5 INSTALLATION OF CORRUGATED POLYETHYLENE PIPE AND PIPE FITTINGS

- A. General: Install Corrugated Polyethylene Pipe in accordance with ASTM D2321 and governing authorities having jurisdiction, except where more stringent requirements are indicated.
- B. Acceptance of Pipe: Acceptance will be on the basis of tests specified herein before. The quality of all materials used in the pipe, the process of manufacture, and the finished pipe shall be subject to review by the Engineer. Inspection may be made at the place of manufacture, or on the work site after delivery or at both places and the pipe shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though sample pipe units may have been accepted as satisfactory at the place of manufacture. All pipe which is rejected shall be immediately removed from the project site by the Contractor.
- C. Pipe Storage: Pipe sections shall not be stored on areas over the newly placed pipe or other pipelines which might be damaged by the superimposed load, and storage sections shall be restricted to approved areas.
- D. Handling Pipe: Each pipe unit shall be handled into its position in the trench only in such manner and by such means, as the Engineer accepts as satisfactory. The Contractor will be required to furnish suitable devices to permit satisfactory support of all parts of the pipe unit when it is lifted.
- E. Alignment and Placement: All pipe shall be placed with extreme care as to grade and alignment. Each pipe shall be so placed as to form a close joint with the next adjoining pipe and bring the inverts continuously to the required grade.
  - 1. Stakeout of drain work and setting of line and grade is the responsibility of the Contractor.
  - 2. The Contractor shall establish centerline and offset stakes at each manhole, plus intermediate centerline and offset stake as needed to ensure proper alignment and grade between manholes. Laser aligning shall not be used to establish a continuous line in excess of 400-feet.
  - 3. Bedding material for the pipe must be installed with care in the area around the pipe. Bedding material must be placed to provide uniform and adequate support under pipe. Do not use blocking to bring pipe up to grade. Bedding shall be crushed stone.

4. Provide bell holes at each joint to permit joint to be assembled properly while maintaining uniform pipe support.
5. Place and consolidate the bedding material under the pipe haunch to provide adequate side support while avoiding both vertical and lateral displacement of pipe.
6. Initial backfill must be completed to a point at least 12-inches over the top of the pipe and be hand placed. Use little or no tamping of initial backfill directly over the top of pipe. Compaction methods may be utilized during final backfilling.
7. No length of pipe shall be laid until the proceeding lengths of pipe have been thoroughly embedded in place, to prevent movement or disturbance of the pipe alignment.
8. Full lengths of pipe shall be used in the installation except that partial lengths may be used at the entrance to structures, and to accommodate the required locations of service connection fittings.
9. Pipe entrances to structures shall be cut flush with the inside face of the structure, and cut ends of the pipe surface within the structure shall be properly finished so that there will be no protrusion, ragged edges or imperfections that will impede or affect the hydraulic characteristics of the stormwater flow. The method of cutting and finishing shall be subject to the approval of the Engineer.
10. The Contractor shall protect the installation at all times during construction. The movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be performed at the Contractor's own risk.
11. Jointing of pipe and fittings shall be done in accordance with the printed recommendations of the manufacturer and as specified. The bell end of the pipe shall be thoroughly cleaned. The joint surfaces and the gasket shall be lubricated prior to making up the joint. The position of the gasket shall be checked to ensure the joint has been properly made and is watertight. Care shall be taken not to exceed the manufacturer's recommended maximum deflection allowed for each joint.
12. Each length of pipe shall be pushed home by hand or with the use of bar and block. The use of power equipment, such as a backhoe bucket, is not acceptable.
13. Field-cut pipe ends shall be cut square.

### 3.6 INSTALLATION OF DRAIN MANHOLES AND CATCH BASINS

- A. The bases shall be supported on a compacted level foundation of gravel borrow a minimum of 12 inches thick. Crushed stone may be substituted for gravel borrow if field conditions at the bottom of the excavation are wet.
  1. The Contractor shall install the manholes and catch basins as soon as the pipe laying reaches the location of the structures.
  2. The Contractor shall accurately locate each manhole and catch basin and set accurate templates to conform to the required line and grade. Any manhole or catch basin which is not installed in the correct location or oriented improperly shall be removed and rebuilt in its proper location, alignment, and orientation at no additional cost to the Owner.
  3. Manhole risers and tops shall be installed using approved butyl rubber sealant or rubber gasket for sealing joints of manhole risers and tops; jointing shall be performed in accordance with the manufacturer's recommendations. Manhole risers and tops shall be installed level and plumb. Water shall not be permitted to rise over newly made joints, nor until after inspection as to their acceptability. All jointing shall be done in a manner to ensure watertight joints.
  4. Openings shall be provided in the precast concrete manhole sections to receive entering pipes and these openings shall be made at the place of manufacture. Pipe entrances at catch basins shall have plain beveled openings to accept the type of pipe specified and to be sealed with non-shrink grout. Grout mixture shall follow instructions provided by manufacturer. Pipe connections at drain manholes shall be made as



indicated on the Drawings with either non-shrink grout or integral flexible rubber sleeves and Corrugated Pipe Adapters designed for use with the pipe and sleeves. For grouted joints, surface between pipe and wall shall be completely filled with non-shrink grout and trowelled to provide a smooth surface conforming to both the outside and inside structure wall.

5. Care shall be taken to ensure that the openings are made to permit setting of the entering pipe at its correct elevation as indicated or directed. Manhole risers and tops shall be installed so that the manhole steps shall be in alignment.
6. All holes used for handling shall be thoroughly plugged with non-shrink grout.
7. Cutting or tampering in the field, for purpose of creating new sidewall openings or altering existing openings, will not be permitted except at the discretion of the Engineer or if necessary concrete block manhole(s) shall be used.
8. All interior manhole joints where the sealing material is not flush with the inside wall shall be grouted with non-shrink mortar and finished by hand/wet-brush.
9. A cast-in-place concrete invert shelf and channel shall be poured and shaped to the lower half of the pipes
10. Clean all debris, mortar, and soil from the bottom of all structures prior to final acceptance of the project.

### 3.7 SETTING MANHOLE FRAMES AND COVERS AND CATCH BASIN FRAMES AND GRATES

- A. Manhole and catch basin frames shall be set with tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the Contract Drawings or as directed.
- B. Brick shall be used to bring the frames to the required elevation.
  1. Frames shall be set centered with the opening in the top of the precast structure on a minimum 12 inches of brick in a full bed of mortar. A thick ring of mortar extending to the outer edge of brick or concrete shall be placed all around the bottom flange of the cast iron frame. The mortar shall be smoothly finished to a height of 5 inches above the flange for 8-inch frames and sloped to shed water away from the frame.
  2. Completed brick installation shall be coated with mortar at least a  $\frac{3}{4}$  inch thick on the outside to provide a fully sealed and watertight collar between the top manhole section and the cover frame.
  3. Only clean bricks shall be used in brickwork to adjust frame elevations. The brick shall be moistened by suitable means.
- C. Manhole covers shall be left in place in the frame until completion of other work at the manholes.
- D. Where directed, the castings shall be temporarily set at such grades as to provide drainage during construction. The castings of structures located within the pavement area shall not be completely set to the established grade until the bottom course of pavement has been laid. The final setting of all other castings shall be performed at the proper stage of construction.

### 3.8 CHANGE IN TYPE

- A. When an existing catch basin is to be converted to a manhole, the frame and grate shall be carefully removed and a new frame and cover installed to finish grade. If in the opinion of the Engineer the existing casting is reusable, it may be reused in the work, otherwise, it shall be disposed of off-site.

1. The sump of the catch basin shall be thoroughly cleaned of debris and silt and the interior surfaces brushed to remove contaminants.
2. The sump shall be thoroughly filled with compacted gravel to a level no greater than 6 inches below the pipe invert. A cast-in-place concrete invert shelf and channel shall be poured and shaped to the lower half of the pipes.
3. New openings in existing structures shall be carefully cut with power saws of the proper size and elevation to accept the new connection. Damage to the structure caused by the Contractor's construction methods shall be repaired at no additional cost.

### 3.9 STRUCTURE REBUILT

- A. When in the opinion of the Engineer existing masonry structure walls show deterioration, the structure shall be rebuilt. The casting and deteriorated masonry shall be removed in a careful and neat manner until only a sound condition remains. Concrete blocks shall be used to rebuild the structure. The new masonry construction, replacing of the casting, and other incidental work shall be performed as specified above.
  1. The Contractor's base bid shall include rebuilding 10 vertical linear feet of existing manhole or catch basin structures.

### 3.10 INSTALLATION OF WATER QUALITY STRUCTURES

- A. Contractor shall take appropriate action to protect all structure components throughout the installation and construction process. Care shall be taken in loading, transporting, and unloading to prevent damage to materials during storage and handling.
- B. Install water quality structures per manufacturer's specifications.
- C. The installation of a precast concrete structure should conform to ASTM C 891 for the construction of manholes.
- D. The precast concrete structure shall be installed in sections in the following sequence:
  1. Aggregate Base: Structure shall be supported on a compacted level foundation of gravel borrow or crushed stone a minimum of 12 inches thick.
  2. Base Slab
  3. Treatment chamber section(s)
  4. Transition slab (if required)
  5. Bypass Section
  6. Connect inlet and outlet pipes
  7. Riser section and/or transition slab (if required)
  8. Maintenance rider section(s) (if required)
  9. Frame and access cover
- E. The precast base shall be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, shall be installed in accordance with the precast concrete manufacturer's installation requirements.
- F. Adjustment of the stormwater quality treatment structure can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets shall be repaired or replaced as necessary. Once the stormwater quality treatment structure has been constructed, any lift holes shall be plugged watertight with mortar or non-shrink grout.

- G. Internal components requiring field installation shall be installed by the Contractor in accordance with the manufacturer's specifications and installation requirements.
- H. Inlet and outlet pipes should be securely set into the structure using approved pipe seals (flexible boot connections) so that the structure is watertight.
- I. Grade rings shall be installed to set the frame and cover at the required elevation. The grade rings shall be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover shall be set in a full bed of mortar at the elevation specified.
- J. If precast tank sections are to be field assembled, adequate waterproofing shall be used at the joint to resist the waterhead at that joint.

### 3.11 INSTALLATION OF PRECAST CONCRETE TANKS AND VAULTS

- A. The bases shall be supported on a compacted level foundation of gravel borrow a minimum of 12 inches thick. Crushed stone may be substituted for gravel borrow if field conditions at the bottom of the excavation are wet.
- B. The precast base shall be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, shall be installed in accordance with the precast concrete manufacturer's recommendations. Structure sections shall be installed level and plumb. Water shall not be permitted to rise over newly made joints, nor until after inspection as to their acceptability. All jointing shall be done in a manner to ensure watertight joints.
- C. Adjustment of the structure can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets shall be repaired or replaced as necessary. Once the structure has been constructed, any lift holes shall be plugged watertight with mortar or non-shrink grout. Any precast structure which is not installed in the correct location or oriented improperly shall be removed and rebuilt in its proper location, alignment, and orientation at no additional cost to the Owner.
- D. Inlet and outlet pipes should be securely set into the structure using approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight. Care shall be taken to ensure that the openings are made to permit setting of the entering pipe at its correct elevation as indicated or directed. Cutting or tampering in the field, for purpose of creating new sidewall openings or altering existing openings, will not be permitted.
- E. Grade rings shall be installed to set the frame and cover at the required elevation. The grade rings shall be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover shall be set in a full bed of mortar at the elevation specified.
- F. Clean all debris, mortar, and soil from the bottom of all structures prior to final acceptance of the project.

### 3.12 AREA DRAINS

- A. Install area drains per manufacturer specifications.

- B. The specified PVC surface drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures. The backfill material shall be crushed stone or other granular material meeting the requirements of class 2 material as defined in ASTM D2321. Bedding and backfill for surface drainage inlets shall be placed and compacted uniformly in accordance with ASTM D2321. The drain basin body will be cut at the time of the final grade. No brick, stone or concrete block will be required to set the grate to the final grade height.
- C. For H-20 load rated installations, a concrete ring shall be poured under and around the grate and frame as indicated on the Drawings.

### 3.13 INLINE DRAINS

- A. The specified PVC surface drainage inlet shall be installed using conventional flexible pipe backfill materials and procedures. The backfill material shall be crushed stone or other granular material meeting the requirements of class 1 or class 2 material as defined in ASTM D2321. Bedding and backfill for surface drainage inlets shall be well placed and compacted uniformly in accordance with ASTM D2321. The drain basin body will be cut at the time of the final grade. No brick stone or concrete block will be required to set the grate to the final grade height. For H-20 load rated installations, a concrete ring will be poured under and around the grate and frame. The concrete slab must be designed taking into consideration local soil conditions, traffic loading, and other applicable design factors. For other installation considerations such as migration of fines, groundwater, and soft foundations refer to ASTM D2321 guidelines.

### 3.14 DRAIN COUPLINGS

- A. Couplings which are factory manufactured shall be installed at all connections from existing pipe to proposed pipe unless the existing pipe is the same material as the proposed pipe and the bell and spigot end of the pipes to be connected are compatible and free from defects. All drain couplings shall be installed in accordance with the manufacturer's recommendations for the types of pipe to be connected.

### 3.15 CLEANOUTS

- A. Install cleanouts and extensions from drain pipe to cleanout at grade as indicated on the Contract Drawings. Set cleanout frame and cover in concrete 18 by 18 by 6-inches deep, except where location is in bituminous or concrete paving. Set top of cleanout 1-inch above surrounding earth grade or flush with grade when installed in paving.

### 3.16 TAP CONNECTIONS

- A. Make connections to existing underground drainage structures, so that finished work will conform as nearly as practicable to requirements specified for new work. The contractor shall verify the location, size, invert, and type of existing pipes at all points of connection prior to making the connections.
- B. Make branch connections from side into existing piping by installing a wye or T-wyes, and couplings manufactured for use with the same type of pipe as indicated on the Contract Drawings. The Contractor shall install a 45-degree wye branch or 90-degree tee fittings in the drain pipe at all locations where storm service pipe connections are shown on the Drawings. Connections of the storm service pipes shall be made into the wye branches or tees by means of 45-degree bends. The connections shall be made thoroughly watertight and concrete shall be placed under each connection to bear on undisturbed earth and firmly support the connection.

- C. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris, concrete, or other extraneous material that may accumulate.
- D. Connections into existing drainage facilities shall be performed in accordance with the requirements of the City of Worcester. The Contractor shall comply with all such requirements, including securing of all required permits and paying the costs thereof.

### 3.17 BACKFILLING

- A. General: Conduct excavation and backfill operations for structure and pipe installations in accordance with Section 312000 – EARTH MOVING, local requirements, and the contract documents.
- B. Initial backfill shall be placed evenly on both sides of the pipe to distribute the load and not to cause movement or deflection of the pipe.

### 3.18 INSTALLATION OF IDENTIFICATION

- A. Install continuous plastic underground warning tape during back-filling of trench for underground storm drainage system piping. Locate tape two-feet below finished grade, directly over piping.

### 3.19 FIELD TESTING OF CORRUGATED POLYETHYLENE PIPING

- A. The pipe shall be cleaned and visually inspected for offsets and obstructions prior to testing.
- B. The total length of each pipe installed on the project shall be tested or inspected for deflection. Conveyance pipes connecting at both ends to concrete drainage structures (catch basins, manholes, outlet control structures, water quality structures, etc.) shall be mandrel tested. Deflection of pipes used for stormwater detention/retention/infiltration systems, and pipes connecting to wye connections, building connections, trench drains, and other connections that do not allow mandrel testing shall be verified by visual inspection by the Owner's Representative during installation.
- C. Mandrel tests shall be performed by the Contractor and observed by the Owner's Representative not sooner than 20 days after completion of installation and compaction of backfill. Testing for pipes greater than 24-inch in diameter shall be tested prior to the installation of drainage structure cone and frame.
- D. Installed pipe shall be tested to ensure that the maximum deflection of the pipe does not exceed 7.5 percent of its base inside diameter. The base inside diameter is defined as the specified nominal diameter minus the allowable inside diameter tolerance of 1.5% but not more than 1/2 inch.
- E. A mandrel shall be pulled through the pipe by hand to ensure that maximum allowable deflections have not been exceeded. The mandrel diameter shall be verified and approved by the Owner's Representative prior to use. Use of an unapproved mandrel will invalidate the test. If the mandrel fails to pass through the pipe, the pipe will be deemed to be over-deflected.
- F. The mandrel shall be a rigid device, with an odd number of legs (9 legs minimum) having an effective length not less than its nominal diameter. The mandrel shall be fabricated of steel with pulling rings at each end.

- G. The minimum diameters at any point along the full length are as follows:

| Nominal Size | Minimum Mandrel Diameter |
|--------------|--------------------------|
| 6"           | 5.3"                     |
| 8"           | 7.0"                     |
| 10"          | 8.8"                     |
| 12"          | 10.6"                    |
| 15"          | 13.2"                    |
| 18"          | 15.8"                    |
| 24"          | 21.1"                    |
| 30"          | 26.4"                    |
| 36"          | 31.7"                    |
| 42"          | 37.0"                    |
| 48"          | 42.2"                    |
| 54"          | 47.5"                    |
| 60"          | 52.8"                    |

### 3.20 FIELD QUALITY CONTROL

- A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.
- B. Video Inspections: Seven days after the completion of the backfilling of each section of new pipe, as defined as a length of pipe between two manholes, the Contractor will provide a televised inspection of the pipe to be submitted to the Designer. The Owner's Representative shall be present during the recording. The recording shall be in DVD color format with audio and will show a clear picture of the inside of the new pipe. If the Designer determines that the DVD is unacceptable for review the contractor shall re-televisize the line until an acceptable DVD has been submitted. In the event that the pipe is not acceptable for any reason relating to the proper construction of the pipe according to these specifications, the Contractor will be responsible to re-excavate and repair the defects to the satisfaction of the Designer at no additional cost.
- C. Cleaning: Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
1. In large, accessible piping, brushes and brooms may be used for cleaning.
  2. Place watertight plugs in ends of uncompleted pipe at end of day or whenever work stops. If water is in the trench when work is resumed, the plug shall not be removed until the trench has been dewatered and all danger of water entering the pipe eliminated.
  3. Flush piping between manholes to remove collected debris.
- D. Interior Inspection: If deemed necessary by the Owner's Representative, inspect piping to determine whether line displacement or other damage has occurred.
1. Make inspections after pipe between manholes has been installed and approximately 2 feet of backfill is in place, and again at completion of project.
  2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, the Contractor shall correct such defects and reinspect.
- E. Prior to acceptance of the storm drainage system, the Contractor shall submit the following to the Architect and to the local authority:

1. System As-Built Plan stamped by a Professional Land Surveyor or Engineer Registered in the Commonwealth of Massachusetts.
2. Video inspection DVDs and report: The report shall document the observations of the video inspections.
3. Deflection test report: The report shall fully describe the test procedures and list the test results. The report shall be signed by the Contractor's superintendent.

3.21 FINAL INSPECTION

- A. Final inspection and acceptance of the storm drainage system shall be made by the Owner's Representative and the utility owner having jurisdiction over the particular system.
- B. Prior to placing the systems in service, all components shall be inspected, with the Owner's Representative present, to ensure that no debris or other contaminants are present. If necessary, the Contractor shall clean the structures and flush piping.
- C. The Contractor is responsible for coordinating and scheduling the inspection of the work by local jurisdictional authorities. No additional payment will be made for inspections and permits required in the performance of the work.

End of Section

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# **APPENDIX A**

## **PRELIMINARY GEOTECHNICAL REPORT**

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April 9, 2018

Mr. Eric Moore, AIA  
Lamoureux Pagano & Associates, Inc.  
108 Grove Street, Suite 300  
Worcester, MA 01605  
Tel: (508) 752-2831  
Fax: (508) 757-7769  
E-mail: EMoore@lamoureuxpagano.com

**Re: Geotechnical Report  
Proposed Worcester South High School  
Worcester, Massachusetts  
LGCI Project No. 1644**

Dear Mr. Moore:

Lahlaf Geotechnical Consulting, Inc. (LGCI) has completed subsurface explorations at the site of the proposed Worcester South High School in Worcester, Massachusetts. This report contains the results of our subsurface explorations and our foundation design and construction recommendations. We are submitting our report electronically. Please notify us if you require a hard copy.

The soil samples and rock cores from our explorations are currently stored at LGCI for further analysis, if requested. Unless notified otherwise, we will dispose of the soil samples and rock cores after three months.

Thank you for choosing LGCI as your geotechnical engineer.

Very truly yours,

**Lahlaf Geotechnical Consulting, Inc.**



Abdelmadjid M. Lahlaf, Ph.D., P.E.  
Principal Engineer



**LGCI**  
Lahlaf Geotechnical Consulting, Inc.

---

**GEOTECHNICAL REPORT  
PROPOSED WORCESTER SOUTH HIGH SCHOOL  
WORCESTER, MASSACHUSETTS**

LGCI Project No. 1644

April 9, 2018

Prepared for:

**LAMOUREUX PAGANO & ASSOCIATES, INC.**

108 Grove Street, Suite 300

Worcester, MA 01605

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**GEOTECHNICAL REPORT**  
**PROPOSED WORCESTER SOUTH HIGH SCHOOL**  
**WORCESTER, MASSACHUSETTS**  
LGCI Project No. 1644  
April 9, 2018

Prepared for:

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Abdelmadjid M. Lahlaf, Ph.D., P.E.  
Principal Engineer

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Worcester, Massachusetts  
LGCI Project No. 1644**

## **1. PROJECT INFORMATION**

### **1.1 Project Authorization**

This report presents the results of three (3) phases of geotechnical services performed by Lahlaf Geotechnical Consulting, Inc. (LGCI) for the proposed Worcester South High School in Worcester, Massachusetts.

The first phase of our services included a review of the available information at the site and was part of a feasibility study. It was performed in general accordance with our proposal No. 16110 dated November 17, 2016. Mr. Michael Pagano of Lamoureux Pagano & Associates, Inc. (LPA) authorized our services by signing our proposal on November 22, 2016.

The second phase of our services was part of the Schematic Design (SD Phase). It included performing preliminary explorations at the site and was performed in general accordance with our proposal No. 17098 dated July 21, 2017. Mr. Michael A. Pagano of LPA authorized our services by signing our proposal on July 25, 2017.

The third phase of our services was part of the Design Development (DD Phase) and included performing additional explorations at the site. The DD Phase services were performed in general accordance with our proposal No. 17165-Rev.1 revised January 30, 2018. Our services for the latter proposal were verbally approved by LPA.

### **1.2 Purpose and Scope of Services**

The purpose of this study was to obtain additional subsurface information at the site and to provide recommendations for foundation design and construction. This report includes the results from all three of our studies at the site and supersedes the previous preliminary geotechnical report dated September 25, 2017.

To date, LGCI has performed the following services:

- Reviewed the existing information about the site.
- Coordinated our field explorations for the SD Phase with LPA and with the Worcester South High School staff. We coordinated our DD Phase services with LPA, Fontaine Bros., Inc., Heery International, Lord Associates, Nitsch Engineering, Inc., City of Worcester water Department staff, and the Worcester South High School staff.
- Marked the exploration locations at the site and notified Dig Safe Systems Inc. (Dig Safe) and the City of Worcester DPW. We also coordinated with a private utility clearance company who was engaged directly by the City to clear our exploration locations for electric lines during the DD Phase explorations.



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- Engaged an excavation subcontractor to excavate fourteen (14) test pits during the SD Phase and twenty-six (26) test pits during the DD Phase. Our excavation subcontractor also performed tree clearing during the DD Phase to provide access to the test pit and soil boring locations.
- Engaged a drilling subcontractor to advance eight (8) soil borings during the SD Phase and thirty (30) soil borings during the DD Phase.
- Performed five (5) double-ring infiltrometer tests in five (5) test pits (one each) at locations selected by Nitsch Engineering, Inc. (Nitsch) during the DD Phase.
- Installed five (5) groundwater observation wells in five (5) borings (one each) in the DD Phase.
- Provided a geotechnical field engineer at the site to coordinate and observe the borings and test pits, describe the soil samples, and prepare field logs.
- Submitted four (4) soil samples during the SD Phase and thirteen (13) soil samples during the DD Phase for grain-size analyses.
- Prepared this geotechnical report containing the results of our subsurface explorations and our recommendations for foundation design and construction.

Our scope also includes attending meetings, reviewing foundation drawings, preparing earth moving specifications, performing contract document review, slope stability analyses, and providing construction services. Our slope stability analyses will be performed after the proposed wall on the southern side of the site is designed.

LGCI did not perform environmental services for this project. LGCI did not perform an assessment to evaluate the presence or absence of hazardous or toxic materials above or below the ground surface at or around the site. Any statement about the color, odor, or the presence of suspicious materials included in our boring and test pit logs or report were made by LGCI for information only and to support our geotechnical services. No environmental recommendations and/or opinions are included in this report.

Recommendations for stormwater management, erosion control, pavement design, and detailed cost or quantity estimates are not included in our scope of work.

### **1.3 Site Description**

Our understanding of the existing conditions is based on our field observations, our discussions with LPA, and on the following drawings:



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- “South High Community School, Existing Structural Conditions -DRAFT,” (Structural Report) dated November 18, 2016 and provided to LGCI by LPA via e-mail on December 5, 2016.
- Logs of previous soil borings and test pits advanced at the site of the existing high school and provided to LGCI by LPA via e-mail on November 8, 2016.
- Drawings L1 and L2 titled: “Site Layout, Southwest High School, Worcester, Mass,” (Existing School Layout Plan) prepared by CW Buckley Architects, Inc. and dated May 17, 1976.
- Drawings L3 and L4 titled: “Site Grading, Southwest High School, Worcester, Mass,” (Former Grading Plan) prepared by CW Buckley Architects, Inc. and dated May 17, 1976.
- Drawings S1 to S4 titled: “Foundation Plans, Southwest High School, Worcester, Mass,” (Existing School Foundation Plans) prepared by CW Buckley Architects, Inc. and dated May 17, 1976.
- Drawings EX2.0 to EX2.4 titled: “Existing Conditions Plan, South High Community School, Worcester, Massachusetts,” (Proposed Grading Plan), dated May 11, 2018 and downloaded by LGCI from LPA’s ftp site on April 6, 2018.

The existing high school is located at 170 Apricot Street in Worcester, Massachusetts as shown in Figures 1, and 2. The site is bordered by Apricot Street on the southern side, by wooded land and private properties on the western side, by wooded land and wetlands on the northern side, and by the Arthur F. Sullivan Middle School on the eastern side.

The existing high school consists of a building with a nearly square shape. The building has a basement (Level 1) on the eastern side with a finished floor elevation (FFE) at El. 769 feet. The western portion of the building (Level 2) has a finished floor elevation of El. 785 feet.

A driveway and a narrow strip of parking spaces loops around the southern, western, northern, and part of the eastern sides of the school. Additional parking is available east and downhill of the school building.

Two athletic fields are located on the northern side and northwestern side of the school building. The field on the northwestern side of the existing school is a practice field. The field on the northern side of the existing school building is the larger of the two fields and includes a track.

The Existing Conditions Plan indicates that the existing grades around the existing school range between El. 768 feet near the northwestern corner and El. 785 feet near the southeastern corner. The grades within the existing track range between about El. 765 feet and El. 767 feet, and the grades in the athletic field, northwest of the existing building, range between about El. 766 feet



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and El. 769 feet. The grades in the lower parking lot range between about El. 735 feet and El. 751 feet.

Based on the Former Grading Plan, the grades before the construction of the existing school were as follows:

- Level 1: between El. 769 feet and El. 785 feet, i.e., required cuts up to 16 feet to reach FFE of El. 769 feet.
- Level 2: between El. 771 feet and El. 787 feet, i.e., required cuts of up to 2 feet and up to 14 feet of fill, including fill of up to 13 feet within the existing pool area to reach FFE of El. 785 feet.
- Field on the northwestern side of existing school building: between El. 760 feet on the western side and about El. 772 feet near the central and eastern sides, i.e., cuts of about 5 feet and fill of up to 7 feet were required to achieve the existing grades.
- Track: between El. 755 feet and El. 770 feet with a local high at about El. 775 feet, and local low at about El. 750 feet, i.e., cuts of about 5 feet near the center of the field and up to 11 feet of fill on the eastern side to reach the existing grades.
- The Existing School Layout Plan indicates that stockpiles of boulders and topsoil were created during the cuts and fills performed during the construction of the existing school. These boulder and topsoil disposal areas are scattered throughout the site in landscaped areas, including near the northern end of the northern field. It is not known whether these stockpiles were buried in place or removed from the site.

Based on our review of the Existing School Foundation Plans, the existing building is founded on shallow spread and continuous footings. The foundations of Level 2 appear to be bearing in the fill.

## **1.4 Project Description**

Our understanding of the proposed construction is based on our discussions with LPA, and on the following drawings:

- Drawing EC5.0 titled: "Site Grading Plan, South High Community School, Notice of Intent Submission," (NOI Site Grading Plan) prepared by LPA and dated March 21, 2018.
- Drawings C7.0 to C7.4 (5 sheets) titled: "Site Grading Plan, South High Community School, Worcester, Massachusetts," (Proposed Grading Plan), dated May 11, 2018 and downloaded by LGCI from LPA's ftp site on April 6, 2018.



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**Worcester, Massachusetts**  
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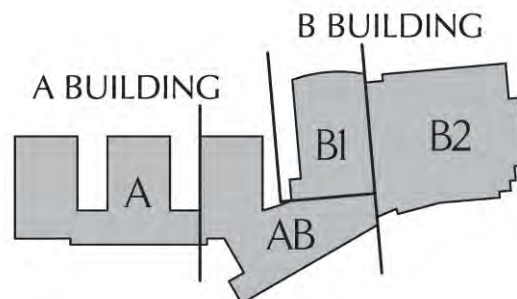
- Drawing S3.1 titled: “Ground Floor Foundation Plan, Section B1, South High Community School,” prepared by LPA, dated May 11, 2018 and downloaded by LGCI from LPA’s ftp site on April 6, 2018.
- Drawing S3.2 titled: “Ground Floor Foundation Plan, Section B2, South High Community School,” prepared by LPA, dated May 11, 2018 and downloaded by LGCI from LPA’s ftp site on April 6, 2018.
- Drawing S3.3 titled: “First Floor Foundation Plan, Section A, South High Community School,” prepared by LPA, dated May 11, 2018 and downloaded by LGCI from LPA’s ftp site on April 6, 2018.
- Drawing S3.4 titled: “First Floor Foundation Plan, Section AB, South High Community School,” prepared by LPA, dated May 11, 2018 and downloaded by LGCI from LPA’s ftp site on April 6, 2018.

Based the Proposed Grading Plan, the proposed construction will consist of a new school building that will be located north of the existing school building. The proposed construction will include paved driveways and parking area, and athletic fields. The proposed driveway on the southern side of the site will require the construction of a southern retaining wall. Other retaining walls will be required at the site to achieve the proposed grades. A description of the proposed building, southern retaining wall, and proposed paved areas and athletic fields is provided below.

#### **1.4.1 Proposed Building**

The proposed building will extend across the existing track and the lower parking lot northeast of the existing building.

Based on the foundation plans S3.1 to S3.4, the proposed building will consist of three portions labeled A Building, AB Building, and B1 and B2 Building. A key plan showing the different portions of the proposed building is shown below.



The proposed building's ground floors will generally match the topography of the site. Accordingly, the proposed building will have a lower at-grade level, referred to as the Ground Floor, that will be located mostly in the existing lower parking lot; and an upper at-grade floor, referred to as the First Floor, that will be mostly located in the existing track. Based on foundation plans S3.1 to S3.4, the proposed building will have finished floor elevations (FFE) as follows:

- B1 Building: El. 750 feet
- B2 Building: El. 746 feet in the central portion, and El. 750 feet on the northern and southern sides
- AB Building: El. 768 feet
- A Building: El. 768 feet

Based on these grades and on the Proposed Grading Plan, little fill will be required for the First Floor (A and AB Buildings), while fill of up to 9 feet will be required on the northern side of the Ground Floor (B1 and B2 Buildings). Cuts of up to 26 feet will be required on the southern side of the B1 and B2 Buildings.

The southern perimeter wall of the B1 and B2 Buildings will be designed as a retaining wall. Based on the Proposed Grading Plan, the finished grade at the exterior of this wall will be about El. 767, i.e., the proposed wall will have an exposed height of about 17 feet. The construction of this wall will require a support of excavation (SOE) system. We understand that at this time, the type of the SOE system has not been selected. SOE systems being considered include a soldier pile and lagging wall and a soil nail wall. The wall at the transition between the AB Building and the B1 and B2 Building will also be designed as a retaining wall.

The proposed column loads were not available at the time of this report.

#### **1.4.2 Southern Retaining Wall**

The Proposed Grading Plan shows large cuts on the southern side of the site to allow for the construction of the proposed access road on the southern side of the site. The proposed wall will separate the site from the wooded land on the southern side of the site and will be about 600 feet long. The ground on the upper side of the proposed wall will slope upward from the top of the wall to higher elevations. Based on the grades shown in the NOI Site Grading Plan, the proposed grades on the lower side of the proposed wall will range between El. 783 feet and El. 771 feet. The grades on the upper side of the proposed wall will range between El. 800 feet and 780 feet. The proposed wall will have an exposed height that will range between about 10 and 17 feet.

At this time, the type of wall has not been selected. We understand that a mechanically stabilized earth (MSE) wall has been ruled out because of the wide extent of excavation



needed to install the reinforcing geogrid. We understand that a gravity modular block wall and possibly a soil nail wall are being considered.

### **1.4.3 Parking Lots, Driveways, and Athletic Fields**

The proposed construction will include an access road, paved parking area, and athletic fields. The proposed access road will start in the parking lot near the northeastern corner of the proposed building on the northern side of the site. It will extend in a westerly direction and will loop around the proposed AB and B Buildings before it continues south and east to Apricot Street. The grade of the proposed access road ranges between El. 742 feet near the northeastern corner of the proposed building to about El. 767 feet just west of the proposed AB Building and rises to El. 797 feet near Apricot Street. The construction of the proposed access road will require up to 14 feet of fill on the northern side and up to 19-foot cuts on the southern side of the site. The proposed access road will require a retaining wall separating the site from the Conservation Restriction Area located north of the site. This wall will have an exposed height that will range up to about 16 feet. We understand that this wall will be an MSE wall.

A walkway is proposed connecting the access road to the northern side of the proposed B1 Building. Two terraced retaining walls will be required on the northern side of the proposed walkway near the proposed building. These walls will have exposed heights ranging up to 7 feet.

Another site retaining wall will be required near the southwestern corner of the proposed B2 Building. It will extend from the southwestern corner of the building in an easterly direction, lining the stairs leading to the lower parking lot. This wall will have an exposed height ranging up to 19 feet.

The proposed construction includes a paved parking lot on the southern side of the proposed A and AB Buildings and will have finished grades ranging between El. 767 feet and El. 770 feet. This parking lot will be partially constructed within the footprint of the existing building after the latter is demolished. Construction of this parking area will require little cuts and fill. Additional parking will be provided along widened areas of the proposed access road.

A football field with stands and a practice field are proposed south of the proposed building. Both fields will be constructed within the footprint of the existing building after the latter is demolished. We understand that the proposed fields will have finished grades that will range between El. 774 feet and EL. 775 feet. The athletic fields will require fills up to 5 feet on the western side and cuts of up to 13 feet on the eastern side. A retaining wall will be required on the southern side of the proposed practice field and will have an exposed height of 5.5 feet.



A small building that will house bathrooms will be constructed just south of the track.

## **1.5 Elevation Data**

The Former Grading Plan and the 2017 Progress Survey Plan do not include a reference for the elevation datum. We believe that the Proposed Grading Plan may be referenced to the National American Vertical Datum of 1988 (NAVD 88). Since the elevations in the Former Grading Plan are somewhat similar to those in the 2017 Progress Survey Plan, we believe that the Former Grading Plan may be referenced to the City of Worcester Datum which is 0.16 feet lower than the NAVD 88, i.e.,  $\text{NAVD 88} = \text{Worcester Datum} + 0.16 \text{ feet}$ .





## **2. SITE AND SUBSURFACE CONDITIONS**

### **2.1 Surficial Geology**

LGCI reviewed the following surficial geological map: “Surficial Geologic Map of the Worcester South Quadrangle, Massachusetts,” prepared by Stone, B.D., Stone, J.R., and DiGiacomo-Cohen, M.L., U.S. Geological Survey, Open-File Report 2006-1260-D (2008).

The surficial geologic map indicates that the natural soils at the site are mostly thin glacial till deposits consisting of a non-sorted, non-stratified matrix of sand, some silt, and little clay, containing scattered gravel clasts and a few large boulders. The surficial geologic map of the site is shown in Figure 3.

### **2.2 Previous Explorations**

LPA provided us with the logs of six (6) soil borings (T-1 to T-5 and T-1A) and thirteen (13) test pits (B-1 to B-13) performed at the site before the construction of the existing high school. The borings indicated 6 inches to 2 feet of topsoil/subsoil overlying very dense fine sand with silt and gravel. The sand layer contained cobbles and boulders. Refusal was encountered in the borings at depths ranging between 13 and 31 feet beneath the original ground surface.

The test pits extended to depths ranging between 7 and 14 feet beneath the ground surface. The test pits indicated 6 inches to 3 feet of topsoil/subsoil overlying fine sand and gravel with stones and boulders. The test pits terminated in the sand layer, except for one test pit that terminated after refusal was encountered on large boulders. The soils encountered in the previous borings and test pits are consistent with the glacial till described in Section 2.1.

The boring and test pit locations, and the logs of the previous borings and test pits are included in Appendix A.

### **2.3 LGCI’s Explorations**

#### **2.3.1 General**

LGCI performed our subsurface explorations in two (2) phases: the Schematic Design (SD) Phase, and the Design Development (DD) Phase. During the SD Phase, we marked our explorations locations in the field in the presence of a representative of the school. During the DD Phase, an LGCI representative accompanied a representative of Nitsch, who staked the exploration locations. LGCI relocated a few explorations to locations that were accessible with the excavation and/or the drilling equipment with little tree clearing. During both phases, LGCI notified Dig Safe and the City of Worcester to assist with utility clearance. In addition, the City of Worcester engaged a private utility locator during the DD Phase explorations to clear the electric utilities at our exploration locations.



### **2.3.2 Soil Borings**

During the SD Phase, LGCI engaged Northern Drill Service, Inc. (NDS) of Northborough, Massachusetts to advance eight (8) soil borings (B-1 to B-8) at the site on August 10 and 11, 2017. During the DD Phase, LGCI engaged NDS to advance thirty (30) soil borings (B-101 to B-131) at the site between February 13, 2018 and March 1, 2018. One out of the thirty-one soil borings, boring B-126, was not performed due to difficult access. As part the DD Phase, five (5) groundwater observation wells were installed in the soil borings B-103-OW, B-110-OW, B-118B-OW, B-123-OW, and B-128-OW. The borings extended to depths ranging between 10 and 41 feet beneath the ground surface.

An LGCI engineer observed and logged the borings in the field. The borings were advanced with a Mobile B-48 ATV-mounted drill rig using 4-inch cased wash boring techniques and 3 1/4-inch-ID hollow stem augers.

The drillers performed Standard Penetration Tests (SPT) and obtained split spoon samples with an automatic hammer semi-continuously or at five-foot intervals as noted on the boring logs in general accordance with ASTM D-1586. Unless notified otherwise, we will dispose of the soil samples after three months.

Upon completion, the boreholes were backfilled with the soil cuttings.

Appendix B contains LGCI's boring logs, and Figures 4A and 4B show the boring locations. Table 1A contains a summary of the borings.

The ground surface elevations shown in the boring logs were provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. on February 12, 2018 and updated on March 28, 2018.

### **2.3.3 Test Pits**

During the SD Phase, LGCI engaged NDS to excavate fourteen (14) test pits (TP-1 to TP-14) at the site on August 14 and 15, 2017. During the DD Phase, LGCI engaged NDS to excavate twenty-six (26) test pits (TP-101-IT to TP-128) at the site between February 12 and 26, 2018. Two (2) test pits (TP-116 and TP-123) were not excavated due to conflict with water lines. The test pits extended to depths ranging between 8 and 14 feet beneath the ground surface.

As part of the DD Phase, five (5) infiltrometer tests were performed at depths of 3 to 4 feet below ground surface in test pits TP-101-IT, TP-105-IT, TP-115-IT, TP-118-IT, and TP-121-IT.



An LGCI engineer observed and logged the test pits in the field. The test pits were excavated with a Komatsu PC-120 excavator. Upon completion, the test pits were backfilled with the excavated materials which were placed and tamped with the excavator bucket in 1- to 2-foot lifts.

Appendix C contains LGCI's test pit logs, Table 1B contains the test pit summary table, and Figures 4A and 4B show the test pit locations.

The ground surface elevations shown in the test pit logs were provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. on February 12, 2018 and updated March 28, 2018.

## **2.4 Subsurface Conditions**

The subsurface description in this report is based on a limited number of borings and test pits and is intended to highlight the major soil strata encountered during our borings and test pits. The subsurface conditions are known only at the actual boring and test pit locations. Variations may occur and should be expected between boring and test pit locations. Boring and test pit logs represent conditions that we observed at the time of our borings and test pits and are edited based on the results of the laboratory test data as appropriate. The strata boundaries shown in our boring and test pit logs are based on our interpretations and the actual transition may be gradual. Graphic soil symbols are for illustration only.

The subsurface description is broken into three (3) sections: borings and test pits for the proposed building, borings and test pits for the proposed retaining wall on the southern side of the site, and borings and test pits for the proposed parking lots, driveways, and athletic fields. Below are the individual descriptions of the subsurface conditions for each section.

### **2.4.1 Proposed Building**

The first section describes the subsurface conditions encountered in the borings and test pits performed within or near the proposed building footprint, including borings B-1 to B-6, B-101 to B-114, B-116 to B-119A, and B-131, and test pits TP-1 to TP-9, TP-14, TP-101-IT to TP-107, and TP-109 to TP-113. The building borings extended to depths ranging between 10 and 41 feet, and the test pits extended to depths ranging between 8 and 14 feet beneath the ground surface. Summaries of the borings and test pits for the proposed building are shown in Tables 2A and Table 2B.

The soil strata encountered in the borings and test pits were as follows, starting at the ground surface:



Asphalt – Asphalt was encountered at the ground surface in borings B-1, B-108, B-109, B-111, B-112, B-114, B-116, and B-131. Asphalt was not encountered at the ground surface in the test pits. The thickness of the asphalt ranged between 2 to 6 inches.

Topsoil/Subsoil – A layer of surficial organic soil was encountered in borings B-2 to B-6, B-101 to B-107, B-110-OW, B-113, and B-117B to B-119A and in all the test pits. The topsoil extended to depths ranging between 0.4 to 4 feet beneath the ground surface. Subsoil, typically described as silty sand and less frequently as poorly graded sand with silt, was encountered below the topsoil in borings B-2, B-4, B-6, B-101 to B-104, and B-107 and in test pits TP-4, TP-5, and TP-7 to TP-9. The subsoil extended to depths ranging between 2 to 6 feet beneath the ground surface. The percentage of fines ranged between 10 to 25 percent. Traces of organic fines and roots were observed in the subsoil.

Fill – A layer of fill was encountered in all test pits and borings advanced within the proposed building footprint, beneath the asphalt or beneath the topsoil/subsoil, except in borings B-2, B-101 to B-104, and B-107 and test pits TP-1, TP-4, TP-7, and TP-8. The fill extended to depths ranging between 1 and 12 feet beneath the ground surface. The fill consisted mostly of silty sand and occasionally as poorly graded sand, well graded sand, or silty gravel. The fines content in the fill generally ranged between 5 to 35 percent. One sample of fill contained 45 to 50 percent fines.

The fill contained traces of organics, roots, and wood. One sample of fill contained traces of asphalt and rebar. The fill also contained up to 5 percent boulders up to 2 feet in diameter. The fill encountered in the explorations performed within the proposed A and AB Buildings did not contain wood and contained only traces of organics in a few explorations performed within the proposed A Building. A few explorations performed within the proposed B1 and B2 Buildings contained wood and organics.

The standard penetration test (SPT) N-values ranged between 3 and 69 blows per foot (bpf), with most SPT N-values between 3 and 30 indicating mostly very loose to medium dense material. The high SPT N-values may be caused by cobbles and boulders in the fill and may not represent the true density of the fill.

Buried Organics – A layer of buried organic soil was observed below the fill in borings B-1, B-5, and B-111 and in test pits TP-6, TP-111, and TP-113. The layer of buried organic soil extended to depths ranging between 4.7 to 12 feet beneath the ground surface. The buried organics typically consisted of silty sand with traces of organic fines, roots, and wood.

Sand – A layer of sand was encountered beneath the topsoil/subsoil, fill, or buried organic soil and extended to the termination depths of the borings and test pits. The sand was mostly described as silty sand and less frequently as poorly graded sand with silt, or well graded sand with silt. The percentage of fines in the sand ranged up to 40 percent. The percentage



of gravel ranged between traces of gravel up to approximately 25 percent. The sand contained up to 5 percent boulders up to 3 feet in diameter.

The SPT N-values in the sand layer ranged between 15 and more than 100 bpf, indicating medium dense to very dense sand.

#### **2.4.2 Southern Retaining Wall**

This section describes the subsurface conditions encountered in the borings and test pits advanced along or near the alignment of the proposed retaining wall on the southern side of the site, including borings B-125, and B-127 to B-130, and test pits TP-119, TP-124, and TP-125. The southern retaining wall borings extended to depths ranging between 17 and 31 feet, and the test pits extended to depths ranging between 12 and 12.5 feet beneath the ground surface. Summaries of the borings and test pits performed for the proposed southern retaining wall are shown in Tables 3A and Table 3B.

The soil strata encountered in the borings and test pits were as follows, starting at the ground surface:

Asphalt – A 4-inch layer of asphalt was encountered at the ground surface in boring B-125.

Topsoil/Subsoil – A layer of surficial organic soil was encountered at the ground surface, and in all the test pits. The thickness of the topsoil ranged between 1 to 4 feet beneath the ground surface. Subsoil was encountered below the topsoil in borings B-128-OW to B-130 and extended to depths ranging between 4 to 8 feet below ground surface. The subsoil was described mostly as silty sand and less frequently as poorly graded sand with silt or well graded sand with silt. The percentage of fines ranged up to 30 percent. Traces of organic fines and roots were observed in the subsoil.

Fill – A layer of fill was encountered beneath the asphalt in boring B-125 and beneath the topsoil in test pits TP-119 and TP-124. The fill extended to depths ranging between 3 and 7 feet beneath the ground surface. The fill consisted of silty sand with up to 30 percent fines and up to 35 percent gravel. The fill contained traces of organics and roots. The fill in test pit TP-124 contained traces of brick and wood. The fill also contained between 5 to 10 percent cobbles up to 8 inches in diameter and up to 5 percent boulders up to 2 feet in diameter.

Sand – A layer of sand was encountered beneath the topsoil/subsoil or fill and extended to the boring and test pits termination depths. The sand was mostly described as silty sand and less frequently as poorly graded sand with silt or well graded sand. The percentage of fines in the sand ranged up to 40 percent with most samples containing between 15 to 40 percent fines. The percentage of gravel ranged between traces of gravel up to approximately 25 percent. In test pit TP-119, the sand layer contained between 5 to 10 percent cobbles up to 6



inches in diameter. The sand in test pit TP-125 contained up to 5 percent boulders up to 1.5 feet in diameter.

The SPT N-values in the sand layer ranged between 14 and 100 bpf, with most SPT N-values higher than 23, indicating medium dense to very dense sand.

#### **2.4.3 Proposed Parking Lots, Driveways, and Athletic Fields**

This section describes the subsurface conditions encountered in the borings and test pits in the proposed parking lots, driveways, and athletic fields, including borings B-7 to B-8, B-115, and B-120A to B-124, and test pits TP-10 to TP-14, TP-108, TP-115-IT to TP-118-IT, TP-120 to TP-122, and TP-126 to TP-128. These borings extended to depths ranging between 10.8 and 46 feet, and the test pits extended to depths ranging between 8.5 and 12 feet beneath the ground surface. A summary of the borings and test pits for the proposed parking lots, driveways, and athletic fields is shown in Table 4A and Table 4B.

The soil strata encountered in the borings and test pits were as follows, starting at the ground surface:

Asphalt – Asphalt was encountered at the ground surface in borings B-8 and B-121 with thicknesses of 6 inches and 2 inches, respectively.

Topsoil/Subsoil – A layer of organic topsoil soil was encountered at the ground surface in borings B-7, B-115, B-120A, and B-122 to B-124, and in all the test pits. The thickness of the topsoil ranged between 0.4 to 2.8 feet beneath the ground surface. Subsoil was encountered below the topsoil in the boring B-7 and in test pits TP-10, TP-126 to TP-128. The subsoil extended to depths ranging between 2 to 5.8 feet below the ground surface. The subsoil was described mostly as silty sand and less frequently as poorly graded sand with silt or poorly graded sand. The percentage of fines ranged up to 25 percent. The percentage of gravel ranged between 5 to 20 percent. Traces of organic fines and roots were observed in the subsoil.

Fill – A layer of fill was encountered beneath the asphalt or topsoil/subsoil in all the borings and in all the test pits except TP-10 and TP-126 to TP-128. The fill extended to depths ranging between 2.1 and 16.5 feet beneath the ground surface. The fill consisted mostly of silty sand and occasionally poorly graded sand. One sample of fill was described as silty gravel and another as silt with sand. The percentage of fines ranged between 15 to 45 percent. The percentage of gravel ranged between traces of fine gravel up to approximately 45 percent. The fill contained traces of organics, roots, and wood. Five samples of fill contained traces of asphalt, brick, concrete, construction debris, and plastic. The fill also contained between 5 to 10 percent cobbles up to 8 inches in diameter and up to 5 percent boulders up to 2 feet in diameter.



The SPT N-values of the fill ranged between 2 and over 100 bpf, with most values between 2 and 41 bpf, indicating very loose to dense material. The high SPT N-values may be caused by cobbles and boulders in the fill and may not represent the true density of the fill.

A layer of buried organic soil was observed below the fill in test pit TP-11 and extended to 6 feet below the ground surface.

Sand – A layer of sand was encountered beneath the topsoil/subsoil or fill in all borings and in all test pits except in TP-13 and TP-122. This layer extended to the termination depths of the boring and test pits. In test pit TP-13, a layer of silt with sand and gravel was encountered beneath the fill layer. The sand was mostly described as silty sand and less frequently as well graded sand. One sample was described as poorly graded sand with silt. The percentage of fines in the sand ranged between 10 to 35 percent. The percentage of gravel ranged between traces of gravel up to approximately 30 percent. The sand layer contained approximately 5 percent boulders ranging between 1.5 to 4 feet in diameter. The layer of sand also contained between 5 and 10 percent cobbles up to 8 inches in diameter.

The SPT N-values in the sand layer ranged between 9 and over 100 bpf, with most SPT N-values between 21 to 100 bpf, indicating medium dense to very dense sand.

## **2.5 Groundwater**

### **2.5.1 General**

The groundwater data obtained during the drilling or excavation and reported in this report is based on observations made during or shortly after the completion of the subsurface explorations and may not represent the actual groundwater levels, as additional time may be required for the groundwater levels to stabilize. Water was introduced into the boreholes during drilling, and the groundwater levels measured at the end of drilling in the borings may not be representative of the actual groundwater conditions. The groundwater levels presented in this report only represent the conditions encountered at the time and location of our explorations. Seasonal fluctuation should be anticipated.

### **2.5.2 Proposed Building**

Groundwater was observed in the borings and test pits advanced within the footprint of the proposed building at depths ranging between 1 and 25.1 feet below ground surface. Three (3) groundwater observation wells were installed within or near the proposed building footprint, including B-103-OW, B-110-OW, and B-118B-OW. The groundwater level measured in the groundwater observation wells are shown in Table 5. The groundwater data available through March 1, 2018 indicates that the groundwater is lower than the FFE of the First Floor but is at or slightly higher than the FFE of the Ground Floor.





### **2.5.3 Proposed Retaining Wall on Southern Side**

Groundwater was observed in the borings and test pits advanced along or near the alignment of the proposed southern retaining wall at depths ranging between 1.5 and 9.4 feet below the ground surface. One (1) groundwater observation well was installed in boring B-128-OW. The groundwater level measured in this groundwater observation well is shown in Table 5. The groundwater data indicate that on March 1, 2018 the groundwater level in groundwater observation well B-128-OW was at El. 778.7 feet. This elevation is higher than the ground surface on the lower side of the proposed wall at the location of the well.

### **2.5.4 Proposed Parking Lots, Driveways, and Athletic Fields**

Groundwater was observed in the borings and test pits in the proposed parking lots, driveways, and athletic fields at depths ranging between 2.5 and 21 feet below ground surface. One (1) groundwater observation well was installed in boring B-123-OW. The groundwater level measured in this groundwater observation well is shown in Table 5. The groundwater level measured in the groundwater observation well on March 1, 2018 in B-123-OW was at El. 773.3 feet. This elevation is lower than the proposed grade at the location of the groundwater observation well.

## **2.6 Double Ring Infiltrometer Tests**

LGCI performed five (5) double ring infiltrometer tests in test pits TP-101-IT, TP-105-IT, TP-115-IT, TP-118-IT, and TP-121-IT. These locations were selected by Nitsch. The tests were conducted in general accordance with ASTM Standard D 3385.

The excavations were first advanced to the test depths of 3 to 4 feet beneath the existing ground surface, where the test pit bottom was leveled using the excavator bucket. After the infiltrometer rings were driven into the ground, the tests were conducted by filling the rings with water. The test pits were advanced deeper after the completion of the tests.

The test results are included in Appendix D. The results include plots of the hydraulic conductivity for flow within the inner and outer rings. The stabilized portions of the plots for the inner ring indicate the permeability values. The results indicate generally low permeability values.

## **2.7 Laboratory Test Data**

LGCI submitted seventeen (17) soil samples obtained from the borings and test pits for grain-size analysis. The laboratory data sheets are included in Appendix E and the results are summarized below.





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| Test Pit/<br>Boring | Sample ID | Sample<br>Depth<br>(ft) | Material     | Percent<br>Gravel | Percent<br>Sand | Percent<br>Fines |
|---------------------|-----------|-------------------------|--------------|-------------------|-----------------|------------------|
| B-5                 | S2        | 2 – 4                   | Fill         | 47                | 30.6            | 22.4             |
| B-7                 | S2        | 2 – 4                   | Fill         | 31.5              | 29.4            | 39.1             |
| B-8                 | S2        | 2 – 4                   | Fill         | 13.4              | 42.4            | 44.2             |
| B-8                 | S3        | 4 – 6                   | Natural Soil | 30.8              | 35.9            | 33.3             |
| B-105               | S3        | 4 – 6                   | Fill         | 3.3               | 49.8            | 46.9             |
| B-110               | S2        | 2 – 4                   | Fill         | 40                | 35.6            | 24.4             |
| B-110               | S4        | 6 – 8                   | Natural      | 20.4              | 51.7            | 27.9             |
| B-118B-OW           | S4        | 6 – 8                   | Natural      | 37.8              | 36              | 26.2             |
| B-119A              | S4        | 6 – 8                   | Fill         | 31.6              | 40.8            | 27.6             |
| B-119A              | S7        | 16 – 18                 | Natural      | 32.9              | 28.9            | 38.2             |
| B-124               | S3        | 4 – 6                   | Fill         | 40.6              | 44              | 15.4             |
| TP-101-IT           | S2        | 1 – 7                   | Fill         | 15.2              | 52.5            | 32.3             |
| TP-102              | S2        | 2 – 6                   | Fill         | 6                 | 47.6            | 46.4             |
| TP-111              | S2        | 0.8 – 5                 | Fill         | 32.8              | 41.1            | 26.1             |
| TP-120              | S2        | 2.5 – 5                 | Fill         | 6.4               | 51.7            | 41.9             |
| TP-120              | S3        | 5 – 12                  | Natural      | 23.2              | 47.8            | 29               |
| TP-124              | S2        | 1 – 7                   | Fill         | 34.3              | 45.5            | 20.2             |



### 3. EVALUATION AND RECOMMENDATIONS

#### 3.1 Foundation Recommendations

##### 3.1.1 General

Based on our field observations, our understanding of the proposed construction, our observation of borings and test pits, and the results of our laboratory testing, there are a few issues that we would like to highlight for consideration and discussion.

Removal of Topsoil/Subsoil, Fill, and Buried Topsoil - The topsoil, the subsoil, the existing fill, and the buried organic soil are not suitable to support the proposed building and should be entirely removed from within the proposed building footprint. The surficial topsoil and the subsoil should be removed from within the footprint of the paved areas and athletic fields.

Based on our explorations, the topsoil/subsoil removal is anticipated to generally extend to depths ranging between about 0.4 and 3.5 feet beneath the ground surface. In a few locations, the removal of the topsoil and subsoil may extend to depths of up to 6 feet.

The existing fill encountered within the proposed A and AB Buildings (First Floor) extended to depths ranging between 2 and 8 feet beneath the ground surface but was generally less than 6 feet deep. It contained a few organics and did not overlay buried organic soil. This fill could be reused after being processed with rock to produce Structural Fill as described below.

The fill and the buried organic soil in the proposed B1 and B2 Buildings extended to depths of up to 12 feet beneath the ground surface. Some of this fill contained organics, and in a few locations, it overlaid organic soil. We anticipate that this fill will not be suitable for reuse. In any case, the existing fill free of organics should be stockpiled separately.

The proposed building foundations should bear on Structural Fill placed directly on the natural sand.

We anticipate that the major consideration during construction will be the removal of the topsoil and subsoil, the existing fill, and the buried topsoil, and the handling and stockpiling of the excavated materials. Excavated topsoil and subsoil, and the buried organic soil should be stockpiled separately from the excavated existing fill.

Ground Improvements – We have considered improving the existing fill in place using aggregate piers or rigid inclusions. However, due to the presence of boulders in the fill, implementation of one of these ground improvement techniques would require pre-trenching for the boulders, i.e., excavating the existing fill to cull out the boulders. We dismissed this option as it would require excavating the fill and placing it back in place after the boulders are removed and before implementing the ground improvements. We believe that this option



is less economical than removing the existing fill, processing it by crushing it with rock, and placing the processed material back as described below.

We have also considered Rapid Impact Compaction. This is a new technology that consists of repeatedly striking an impact plate on the ground surface using a high-energy hydraulic hammer. Rapid Impact Compaction can improve soils to depths of up to 15 feet and does not generate spoils. We dismissed this improvement option due to the presence of buried organic soil observed in the explorations within the proposed B1 and B2 Buildings.

Processing Onsite Materials – To the extent possible, onsite materials should be reused to reduce the quantity of materials disposed of offsite. Based on our explorations, the existing fill and the existing sand are too silty for reuse but can be improved by blending them with clean gravel or with crushed stone. Our explorations indicated that the existing fill contained between 5 and 10 percent cobbles and boulders. The existing sand also contained cobbles and boulders. Accordingly, we believe that the existing fill free of organics and the existing sand could be processed in a crusher with the cobbles and boulders to produce granular fill that is lower in fines and that could be used as Structural Fill or Ordinary Fill if blended with a sufficient proportion of rock. The existing fill free of organics should be stockpiled separately for possible processing before reuse. Materials slated for processing should first be observed by LGCI. To augment the quantity of rock to process with the existing fill and the natural sand, the contractor may consider importing blasted rock to blend it with the existing fill and the natural sand before crushing.

The reuse of onsite materials should be coordinated with the project environmental professional.

### **3.1.2 Footing Design**

- The topsoil/subsoil layer and the existing fill are not suitable to support the proposed footings and should be entirely removed from within the proposed building. The removal should extend beyond the proposed building footprint a distance equal to the distance between the bottom of the proposed footings and the natural soil or 5 feet, whichever is greater.
- We recommend supporting the proposed building on spread and continuous footings bearing on Structural Fill placed directly over the natural soil.
- For footing design, we recommend using a net allowable bearing pressure of 4,000 pounds per square foot (psf).
- The subgrade of footings should be prepared in accordance with the recommendations in Section 4.1.



- All foundations should be designed in accordance with *The Commonwealth of Massachusetts State Building Code 780 CMR, Ninth Edition* (MSBC 9<sup>th</sup> Edition).
- Exterior footings and footings in unheated areas that are placed on the natural soil should be placed at a minimum depth of 4 feet below the final exterior grade to provide adequate frost cover protection. Interior footings in heated areas may be designed and constructed at a minimum depth of 2 feet below finished floor grades.
- We recommend that wall footings have a minimum width of 2 feet, and that column footings have a minimum width of 3 feet. For foundations with a least lateral dimension smaller than 3 feet, the allowable bearing pressure should be reduced to 1/3 of the recommended allowable bearing pressure times the least dimension in feet.
- Wall footings should be designed and constructed with continuous, longitudinal steel reinforcement for greater bending strength to span across small areas of loose or soft soils that may go undetected during construction.
- A representative of LGCI should observe the subgrade of footings to verify that the footing subgrade has been prepared in accordance with our recommendations.

### **3.1.3 Settlement**

We estimate for foundations constructed in accordance with the recommendations contained in this report, that the total post-construction settlement will be less than about 1 inch and that the differential settlement will be 3/4 inch or less over a distance of 25 feet. Total and differential settlements of these magnitudes are usually considered tolerable for the anticipated construction. However, the tolerance of the proposed structure to the predicted total and differential settlements should be assessed by the structural engineer.

## **3.2 Concrete Slab Considerations**

- The proposed floor slabs can be constructed as slabs-on-grade.
- The proposed floor slabs should be supported on a minimum of 12 inches of Structural Fill placed directly over the natural soil.
- We understand that a radon mitigation system will be installed beneath the proposed slab. We understand that the radon mitigation system will include a layer of 12 inches of crushed stone placed directly under the proposed slab. Where a radon mitigation system is installed, the 12 inches of crushed stone could be substituted for the Structural Fill recommended above.



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- Where an under-slab drainage system installed, such as under the slab of the proposed B1 and B2 Buildings, a layer of crushed stone will be placed under the proposed slab, and the Structural Fill recommended above will not be needed. Our recommendations for the under-slab drainage system are presented in Section 3.3.
- Exposed boulders should be removed from the subgrade of the slab and the resulting excavation should be backfilled with Structural Fill.
- A vapor retarder membrane with a minimum thickness of 15 mils could be used beneath the slab. The need for such a membrane should be determined by the architect. The membrane should be protected from puncture during placement of the steel mesh and construction of the slabs.
- For the design of the floor slabs bearing on the materials described above, we recommend using a modulus of subgrade reaction,  $k_{s1}$ , of 100 tons per cubic foot (pcf) (116 pci). Please note that the values of  $k_{s1}$  are for a 1 x 1 square foot area. These values should be adjusted for larger areas using the following expression:

$$\text{Modulus of Subgrade Reaction } (k_s) = k_{s1} * \left( \frac{B+1}{2B} \right)^2$$

where:

$k_s$  = Coefficient of vertical subgrade reaction for loaded area,  
 $k_{s1}$  = Coefficient of vertical subgrade reaction for 1 x 1 square foot area, and  
 $B$  = Width of area loaded, in feet.

Please note that cracking of slabs-on-grade can occur as a result of heaving or compression of the underlying soil, but also as a result of concrete curing stresses. To reduce the potential for cracking, the precautions listed below should be closely followed for construction of all slabs-on-grade:

- Construction joints should be provided between the floor slab and the walls and columns in accordance with the American Concrete Institute (ACI) requirements, or other applicable code.
- Backfill in interior and exterior utility trenches should be properly compacted.
- In order for the movement of exterior slabs not to be transmitted to the building foundation or superstructure, exterior slabs such as approach slabs and sidewalks, should be isolated from the building superstructure.



### **3.3 Under-slab Drains**

Based on the groundwater levels observed in the borings and test pits, and measured in the groundwater observation wells, an under-slab drainage system is not required beneath the proposed A and AB Buildings' slabs. An under-slab drainage system is required beneath the proposed B1 and B2 Buildings' slabs.

The under-slab drainage system should consist of: 1) a minimum of 9 inches of  $\frac{3}{4}$ -inch crushed stone placed below the entire concrete slab, and 2) 6-inch-diameter slotted PVC pipes installed with their inverts at least 15 inches below the bottom of the slab. The pipes should be installed in trenches with a maximum spacing of 20 feet. The trenches should be at least 18 inches wide and 12 inches deep (below the bottom of the 9 inches of crushed stone) to allow placing crushed stone around the PVC pipes.

A non-woven geotextile fabric should be installed for separation between the crushed stone and the underlying soil. The slots on the PVC pipe should be placed facing downward to allow for entry of water at the bottom of the pipe. Clean-outs should be included at the end of each branch and at all changes in direction.

If possible, the water from the under-slab drain should be channeled to flow by gravity to a discharge area or to the City storm drainage system. If the water from the drainage system is channeled to the City storm drainage system, the owner should apply for a discharge permit and should perform analytical tests as required by the permits.

### **3.4 Seismic Design Criteria**

In accordance with Section 1613 of MSBC 9<sup>th</sup> Edition, the seismic criteria for the site are as follows:

- |   |         |
|---|---------|
| • Site Class:   | D       |
| • Spectral Response Acceleration at short period ( $S_s$ ): | 0.180g  |
| • Spectral Response Acceleration at 1 sec. ( $S_1$ ):       | 0.066g  |
| • Site Coefficient $F_a$ (Table 9.4.1.2.4a):                | 1.6     |
| • Site Coefficient $F_v$ (Table 9.4.1.2.4b):                | 2.4     |
| • Adjusted spectral response $S_{ms}$ :                     | 0.288 g |
| • Adjusted spectral responses $S_{m1}$ :                    | 0.158 g |

Based on our observations in the test pits and the results of the borings, the natural soil at the site is not susceptible to liquefaction during a seismic event.

### **3.5 Lateral Pressures for Wall Design and Perimeter Drains**

#### **3.5.1 Lateral Earth Pressures**



We recommend using the following values for the design of retaining walls:

|  |                           |
|--|---------------------------|
| Coefficient of Active Earth Pressure, $K_A$ :  | 0.31                      |
| Coefficient of At-Rest Earth Pressure, $K_o$ : | 0.5                       |
| Coefficient of Passive Earth Pressure, $K_p$ : | 3.2                       |
| Total Unit Weight, $\gamma$ :                  | 125 pounds per cubic foot |

Note: The values in the table are based on a friction angle for the backfill of 32 degrees and neglecting friction between the backfill and the wall. The design active and passive coefficients are based on horizontal surfaces (non-sloping backfill) on both the active and passive sides, and a vertical wall face.

- Exterior walls of below ground spaces and the wall separating the two slab levels should be designed using the “at-rest” pressure coefficient.
- Site retaining walls should be designed using the active earth pressure coefficient described above.
- Passive earth pressures should only be used at the toe of the wall where special measures or provisions are taken to prevent disturbance or future removal of the soil on the passive side of the wall, or in areas where the wall design includes a key.
- Where a permanent vertical uniform load will be applied on the active side immediately adjacent to the wall, a horizontal surcharge load equal to half of the uniform vertical load should be applied over the height of the wall. At a minimum, a temporary construction surcharge of 100 psf should be applied uniformly over the height of the wall.
- We recommend using an ultimate friction factor of 0.50 between the natural soil and the bottom of the retaining wall. Retaining walls should be designed for minimum factors of safety of 1.5 for sliding and 2.0 for overturning.

### **3.5.2 Seismic Pressure**

- In accordance with the *Massachusetts State Building Code, 9<sup>th</sup> Edition*, Section 1610, a lateral earthquake force equal to  $0.100 \cdot (S_s) \cdot (F_a) \cdot \gamma \cdot H^2$  should be included in the design of the wall (for horizontal backfill), where  $S_s$  is the maximum considered earthquake spectral response acceleration (defined in Section 3.4),  $F_a$  is the site coefficient (defined in Section 3.4),  $\gamma$  is the total unit weight of the soil backfill, and  $H$  is the height of the wall.

The earthquake force should be distributed as an inverted triangle over the height of the wall. In accordance with MSBC 9<sup>th</sup> Edition, Section 1610.2, a load factor of 1.43 shall be applied to the earthquake force for wall strength design.



- Temporary surcharges should not be included when designing for earthquake loads. Surcharge loads applied for extended periods of time shall be included in the total static lateral soil pressure and their earthquake lateral force shall be computed and added to the force determined above.

### **3.5.3 Perimeter Drains**

- We recommend that free-draining material be placed within 3 feet of the exterior of walls of below ground spaces and behind site retaining walls.
- To reduce the potential for dampness in below ground spaces, proposed below ground walls should be damp-proofed.
- We recommend that drains be provided behind the exterior of walls of below ground spaces, including the southern perimeter wall of the proposed B1 and B2 Buildings, behind the wall at the transition between the proposed AB Building and the B1 and B2 Buildings; and behind site retaining walls. The drains should consist of 6-inch perforated PVC pipes installed with the slots facing down. Perimeter drains should be installed at the bottom of the wall in 18 inches of crushed stone wrapped in a geotextile for separation and filtration.
- Groundwater collected by the wall drains could be discharged in a lower area if gravity flow is possible. Alternatively, it should be discharged into the street drains. A permit would be required for discharge into street drains. For site retaining walls, the water collected from the drains could be discharged through weep holes. If wetness on the face of the wall is not desirable, the wall drains should be connected to the street drains.

## **3.6 Parking Lots, Driveways, and Sidewalks**

### **3.6.1 General**

The subsurface conditions encountered at the site are generally suitable to support the proposed driveways, parking lots, and sidewalks after preparation of the subgrade as described in Section 4.1.

- We recommend removing the topsoil and subsoil within the footprint of the proposed driveways and parking lots.
- Cobbles and boulders should be removed to at least 18 inches below the bottom of the pavement.
- The existing fill should be improved in the proposed areas in accordance with the recommendations in section 4.1 before placing the subbase layer or other fill to meet the proposed grades.





### **3.6.2 Typical Pavement Section**

A typical, minimum, standard-duty pavement section that could be used for parking areas is as follows:

- 1.5" Asphalt "Top Course"
- 2.0" Asphalt "Base Course"
- 8" Processed Gravel for Sub-Base (MassDOT M1.03.1)

A typical, minimum, heavy-duty pavement section that could be used for areas of heavy truck traffic is as follows:

- 2.0" Asphalt "Top Course"
- 2.5" Asphalt "Base Course"
- 12" Processed Gravel for Sub-Base (MassDOT M1.03.1)

Dense-graded Crushed Stone for Sub-base (MassDOT M2.01.7) could be used in lieu of the Processed Gravel for Subbase (MassDOT M1.03.1) recommended above.

The pavement sections shown above represent minimum thicknesses representative of typical local construction practices for similar use. Periodic maintenance should be anticipated.

Pavement material types and construction procedures should conform to specifications of the "Standard Specifications for Highways and Bridges," prepared by the Commonwealth of Massachusetts Department of Public Works and dated 1988 (with the latest Supplemental Specifications).

Areas to receive relatively highly concentrated, sustained loads such as dumpsters, loading areas, and storage bins are typically installed over a rigid pavement section to distribute concentrated loads and reduce the possibility of high stress concentrations on the subgrade. Typical rigid pavement sections consist of 6 inches of concrete placed over a minimum of 12 inches of subbase material.

### **3.6.3 Sidewalks**

- Sidewalks should be placed on a minimum of 12 inches of Structural Fill with less than 5 percent fines.
- To reduce the potential for heave caused by surface water penetrating under the sidewalk, the joints between sidewalk concrete sections should be sealed with a waterproof compound. The sidewalks should be sloped away from the building or other vertical surfaces to promote flow of water. To the extent possible, roof leaders should not discharge onto sidewalk surfaces.



- We recommend that drains be installed under sidewalks along the proposed retaining wall on the southern side of the site. The drains should be installed beneath the inner side of the curbs under sidewalks. The drain should consist of 6-inch perforated pipe with the perforations facing down, installed with its invert at least 15 inches beneath the top bottom of the sidewalk. The pipe should be surrounded by at least 6 inches of crushed stone on all sides. The crushed stone should be wrapped in a geotextile fabric.
- LGCI will continue monitoring the groundwater observation wells, and may revise our recommendations to include sidewalk drains at other locations based on the groundwater data,

### **3.7 Athletic Fields**

The existing subsurface conditions are suitable to support the proposed athletic fields after the subgrade is prepared in accordance with the recommendations in this report.

- The existing topsoil should be removed before placing fill to raise the grades to meet the proposed finished elevations.
- The subsoil may remain in place after it is proofrolled in accordance with the recommendations in Section 4.1.
- Reuse of onsite materials as fill within the proposed athletic fields should be in accordance with the recommendations in Section 4.4.

### **3.8 Slope Stability Analyses**

We understand that the proposed site retaining walls will be designed by the contractor. LGCI will perform slope stability analyses on the proposed walls after a geometry of the proposed walls, including wall types, heights, and widths are established by the contractor. LGCI generally needs about three weeks from the time the design submittal for the proposed site walls is submitted by the contractor to complete our analyses.



## **4. CONSTRUCTION CONSIDERATIONS**

### **4.1 Subgrade Preparation**

- The topsoil/subsoil layer, root balls, organic soil, the existing fill, and other deleterious matter should be entirely removed from within the proposed building footprint.
- Topsoil/subsoil, organic material, root balls, and other deleterious material should be entirely removed from within the paved areas.
- Foundations of the existing buildings, abandoned foundations, and other abandoned below ground structures should be entirely removed from within the entire construction area.
- The site contractor should note that the subsoil, existing fill, and the underlying natural soil are high in fines and contain boulders.
- Cobbles and boulders should be removed at least 6 inches from beneath footings, i.e., 4.5 feet beneath the proposed FFE within the entire building footprint, and 18 inches beneath the bottom of paved areas, and 24 inches beneath the base material for the turf in athletic fields. The resulting excavations should be backfilled with compacted Structural Fill under the building and with Ordinary Fill under the subbase of paved areas and under the base material in athletic fields.
- The base material of athletic fields should conform to the gradation and placement requirements of the landscape architect or the manufacturer/installer of synthetic turf.
- The base of the footing excavations in the natural soil should be compacted with a dynamic vibratory compactor weighing at least 200 pounds and imparting a minimum of 4 kips of force to the subgrade, before placing concrete.
- The subgrades of slabs and paved areas in the natural soil should be compacted with a heavy vibratory roller compactor imparting a dynamic effort of at least 40 kips.
- Where soft zones are revealed by the compaction effort and where organic soil is exposed, the soft materials or organic soil should be removed and replaced with Structural Fill within the building and with Ordinary Fill beneath the subbase of paved areas.
- Due to the high susceptibility of the natural soil for disturbance under foot and vehicular traffic, we recommend placing a minimum of 6 inches of Structural Fill or ¾-inch crushed stone under footings on top of the natural soil to provide a firm working surface during placement of formwork and rebar.
- After the topsoil and subsoil are removed from within the proposed paved areas, the existing fill should be improved by compacting the exposed surface of the existing fill with at least six



(6) passes of a vibratory roller compactor imparting a dynamic effort of at least 40 kips. Where soft zones of soil are observed, the soft soil should be removed and the grade should be restored using Ordinary Fill to the bottom of the proposed subbase layer.

- After the topsoil is removed from within the proposed athletic fields, the exposed subsoil, existing fill, or natural soil should be proofrolled with a loaded rubber tire truck or with a large vibratory roller compactor imparting a minimum dynamic effort of 40 kips. Where soft zones are indicated by the proofrolling, the soft zone should be removed and the grades should be restored using Ordinary Fill to the bottom of the base material of the proposed turf designed by the landscape architect or the manufacturer/installer of synthetic turf.
- Fill placed within the footprint of the proposed building should meet the gradation and compaction requirements of Structural Fill shown in Section 4.3.
- Fill placed under the subbase of paved areas and under the base material of athletic fields, should meet the gradation and compaction requirements of Ordinary Fill shown in Section 4.3.
- Fill placed in the top 12 inches beneath sidewalks should consist of Structural Fill with less than 5 percent fines.
- When crushed stone is required in the drawings or is used for the convenience of the contractor, it should be wrapped in a geotextile fabric for separation.
- An LGCI geotechnical engineer or his representative should observe the exposed subgrades prior to fill and concrete placement to verify that the exposed bearing materials are suitable for the design soil bearing pressure. If soft or loose pockets are encountered in the footing excavations, the soft or loose materials should be removed, and the bottom of the footing should be placed at a lower elevation on firm soil, or the resulting excavation should be backfilled with Structural Fill or crushed stone wrapped in geotextile fabric for separation.

## **4.2 Subgrade Protection**

The onsite sand may be frost susceptible. If construction takes place during freezing weather, special measures should be taken to prevent the subgrade from freezing. Such measures should include the use of heat blankets or excavating the final six inches of soil just before pouring concrete. Footings should be backfilled as soon as possible after footing construction. Soil used as backfill should be free of frozen material, as should the ground on which it is placed. Filling operation should be halted in freezing weather.

Materials with high fines contents are typically difficult to handle when wet as they are sensitive to moisture content variations. Subgrade support capacities may deteriorate when such soils become wet and/or disturbed. The contractor should keep exposed subgrades properly drained



and free of ponded water. Subgrades should be protected from machine and foot traffic to reduce disturbance.

### **4.3 Fill Materials**

Structural Fill and Ordinary Fill should consist of inert, hard, durable sand and gravel, free from organic matter, clay, surface coatings and deleterious materials, and should conform to the gradation requirements shown below.

#### **4.3.1 Structural Fill**

The Structural Fill should have a plasticity index of less than 6, and should meet the gradation requirements shown below. Structural Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within  $\pm 2$  percentage points of optimum moisture content.

| Sieve Size | Percent Passing by Weight |
|------------|---------------------------|
| 3 inches   | 100                       |
| 1 ½ inch   | 80 - 100                  |
| ½ inch     | 50 - 100                  |
| No. 4      | 30 - 85                   |
| No. 20     | 15 - 60                   |
| No. 60     | 5 - 35                    |
| No. 200*   | 0 - 10                    |

\* 0 - 5 Under sidewalks and outdoor slabs

#### **4.3.2 Ordinary Fill**

Ordinary Fill should have a plasticity index of less than 6, and should meet the gradation requirements shown below. Ordinary Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within  $\pm 2$  percentage points of optimum moisture content.

| Sieve Size | Percent Passing by Weight |
|------------|---------------------------|
| 6 inches   | 100                       |
| 1 inch     | 50 - 100                  |
| No. 4      | 20 - 100                  |
| No. 20     | 10 - 70                   |
| No. 60     | 5 - 45                    |
| No. 200    | 0 - 20                    |



#### **4.4 Reuse of Onsite Materials**

Based on the grain-size analyses, and our field observations, the existing fill and the natural soil at the site do not meet the gradation requirements for Structural Fill and/or Ordinary Fill.

Materials to be used as fill should first be tested for compliance with the applicable gradation specifications.

The reuse of the onsite materials as described in this section should be coordinated with the project environmental professional.

##### **4.4.1 Reuse of Processed Onsite Materials**

The contractor may consider mobilizing a rock crusher to the site. Cobbles and boulders and imported blasted rock can be processed by blending them with the existing fill clean of organic material and natural soil and crushing them to produce a well graded material. Materials processed onsite should meet the gradation requirements of Ordinary Fill and Structural Fill. Materials produced by the crushing operation should be well graded so as to reduce the potential for formation of honey-combs during their placement and compaction. The contractor may consider augmenting the quantity of rock by importing blasted rock for processing with the onsite materials.

Before material is produced for use onsite, the contractor should produce a few batches of material processed using different blending ratios. Grain-size analyses should be performed on each batch. The rock content in the processed material should not be so high that honey combs are formed during placement of the material. Once blending ratios that produce material meeting the gradation requirements of Ordinary Fill or Structural Fill are established, they should be used during the processing operations. Periodic grain-size analyses should be performed to make sure that the proper gradation is maintained.

##### **4.4.2 Reuse of Unprocessed Onsite Materials**

In deep fill areas within the proposed paved areas and athletic fields, excavated onsite fill free of organic soil and natural sand could be reused without processing if the following recommendations are followed:

- Large particles (larger than 6 inches) should be culled out or screened.
- Unprocessed materials should not be used within 3 feet of finished grades under parking lots and athletic fields.
- Unprocessed materials should not be used within the proposed building footprint.



- Please note that soils with more than 20 percent fines contents are generally very sensitive to moisture content variations and are susceptible to frost. Such soils are very difficult to compact at moisture contents that are much higher or much lower than the optimum moisture content determined from the laboratory compaction test. Therefore, strict moisture control should be implemented during stockpiling, placement, and compaction of the onsite soils.
- Unprocessed materials should not be used during wet weather or when they are wet.
- The contractor should protect stockpiled unprocessed materials from exposure to moisture using tarps. The tarps should be secured so as not to be moved by wind or other action.
- Where placed and compacted unprocessed material becomes soft, it should be removed and replaced with suitable backfill at contractor's expense.

#### **4.5 Groundwater Control Procedures**

Based on the groundwater levels encountered in our explorations, we anticipate that groundwater control procedures will be needed for footing and utility excavations. We anticipate that filtered sump pumps installed in pits located at least three feet below the bottom of the excavation may be sufficient to handle surface runoff that may enter the excavation. Where deep trenches are required for utilities, multiple sump pumps would be required to maintain a dry excavation subgrade.

Depending on the type of SOE system used to support the excavation on the southern side of the proposed B1 and B2 Building (in proximity of the northern side of the existing building), well points will be required to lower the groundwater table. The well points should be deep enough and should be installed in grid to maintain the groundwater level at least one foot below the bottom of the excavation. Due to the granular nature of the natural soil, lowering the groundwater table is not anticipated to cause significant settlement of the existing building.

The contractor should submit a groundwater control plan at least two weeks before the start of excavations. The submittal should include details about the components, layout, depth, and installation procedure of the system.

The contractor should be permitted to employ whatever commonly accepted means and practices as necessary to maintain the groundwater level below the bottom of the excavation, and to maintain a dry excavation during wet weather. Groundwater levels should be maintained at a minimum of 1-foot below the bottom of excavations during construction. Placement of reinforcing steel or concrete in standing water should not be permitted.



Proper permits should be obtained from authorities having jurisdiction over the work. At a minimum, the water collected from excavations should be filtered for fines in sedimentation basins before being discharged. The sedimentation basins could be constructed of hay bales wrapped in a geotextile fabric.

To reduce the potential for sinkholes developing over sump pump pits after the sump pumps are removed, the crushed stone placed in the sump pump pits should be wrapped in a geotextile fabric for separation. Alternatively, the crushed stone should be entirely removed after the sump pump is no longer in use and the sump pump pit should be restored with suitable backfill.

#### **4.6 Temporary Excavations**

A temporary support of excavation (SOE) system will be required on the southern side of the proposed B1 and B2 Buildings. The SOE system will be designed by the contractor. The type of SOE system should be selected to safely support the excavation, protect the foundations of the existing building, and maintain a dry excavation. Due to the possible presence of boulders in the existing fill and in the natural sand, we believe that a sheet pile wall will not be feasible. We understand that a soldier pile and lagging wall or a soil nail wall are being considered by the contractor. If a soldier pile and lagging wall is used, the soldier piles should be drilled-in to reduce vibrations and possible damage to the existing building. Care should be exercised during the installation of the bracing of the soldier pile and lagging (tiebacks) and during the installation of the soil nails, if a soil nail wall is used, to reduce the potential for loss of ground that may create a sinkhole beneath the foundation of the existing building.

SOE systems may also be needed at the transition between the proposed AB Building and the B1 and B2 Building, and possibly for the proposed southern retaining wall.

The contractor should submit details about the SOE systems at least two weeks before the start of installation of the SOE systems. The submittals should include details about the components of the system, layout and cross sections showing the subsurface conditions at the cross sections, installation sequence and procedure, and calculations showing anticipated movements of the SOE systems. The SOE submittal should be coordinated with the groundwater control submittal.

All excavations to receive human traffic, including utility trenches, basement or footing excavations, or others (i.e. underground storage tanks, etc.), should be constructed in accordance with the OSHA guidelines.

The site soils should generally be considered Type “C” and should have a maximum allowable slope of 1.5 Horizontal to 1 Vertical (1.5H:1V) for excavations less than 20 feet deep. Deeper excavations, if needed, should have shoring designed by a professional engineer.





The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of the excavation sides and bottom.

## **5. FUTURE WORK**

LGCI's scope includes the following services:

- Assisting LPA in preparing Earth Moving specifications and reviewing the geotechnical aspect of foundation drawings.
- Reviewing the geotechnical aspects of contractor submittals and RFIs.
- Performing slope stability analyses on permanent site retaining walls.
- Providing a field representative during construction to observe the subgrades for footings, floor slabs, and paved areas, and submitting daily field reports documenting our observations and field recommendations.

Submittals and RFIs should be submitted to LGCI at least two to three weeks before our responses are due so that we have adequate time to review and comment.



## **6. REPORT LIMITATIONS**

Our analysis and recommendations are based on project information provided to us at the time of this report. If changes to the type, size, and location of the proposed structures or to the site grading are made, the recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions and recommendations modified in writing by LGCI. LGCI cannot accept responsibility for designs based on our recommendations unless we are engaged to review the final plans and specifications to determine whether any changes in the project affect the validity of our recommendations and whether our recommendations have been properly implemented in the design.

It is not part of our scope to perform a more detailed site history; therefore, we have not explored for or researched the locations of buried utilities or other structures in the area of the proposed construction. Our scope did not include environmental services or services related to moisture, mold, or other biological contaminants in or around the site.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from anticipated conditions are encountered, it may be necessary to revise the recommendations in this report. We cannot accept responsibility for designs based on recommendations in this report unless we are engaged to 1) make site visits during construction to check that the subsurface conditions exposed during construction are in general conformance with our design assumptions and 2) ascertain that, in general, the work is being performed in compliance with the contract documents.

Our report has been prepared in accordance with generally accepted engineering practices and in accordance with the terms and conditions set forth in our agreement. No other warranty, expressed or implied, is made. This report has been prepared for the exclusive use of Lamoureux Pagano & Associates, Inc. for the specific application to the proposed Worcester South High School in Worcester, Massachusetts as conceived at this time.



## **7. REFERENCES**

The Commonwealth of Massachusetts (2017), “The Massachusetts State Building Code, 780 CMR, Ninth Edition.”

The Department of Labor, Occupational Safety and Health Administration (1989), “Occupational Safety and Health Standards - Excavations; Final Rule,” 20 CFR Part 1926, Subpart P.

Massachusetts Highway Department (1988), “Standard Specifications for Highways and Bridges.”

Massachusetts Highway Department (2013), “Supplemental Specification to the 1988 Standard Specifications for Highways and Bridges.”

USGS - Worcester, MA topographic map from [www.digital-topo-maps.com](http://www.digital-topo-maps.com)



**Table 1A - Summary of LGCI Borings  
Proposed Worcester South High School  
Worcester, Massachusetts  
LGCI Project No. 1644**

| Boring No.                       | Ground Surface Elevation (ft.) <sup>1</sup> | Groundwater Depth / El. (ft.) <sup>2</sup> | Bottom of Asphalt/Concrete Depth / El. (ft.) | Bottom of Topsoil/Subsoil Depth / El. (ft.) | Bottom of Fill / Buried Organics Depth / El. (ft.) | Bottom of Boring Depth / El. (ft.) |
|----------------------------------|---|--|--|---|--|------------------------------------|
| <b>Borings performed in 2017</b> |   |  |  |   |  |                                    |
| B-1                              | 746.0                                       | 3.5 / <b>742.5</b>                         | 0.5 / <b>745.5</b>                           | - / -                                       | 12.0 / <b>734.0</b>                                | 17.0 / <b>729.0</b>                |
| B-2                              | 766.0                                       | 4.5 / <b>761.5</b>                         | - / -  | 2.0 / <b>764.0</b>                          | - / -  | 21.0 / <b>745.0</b>                |
| B-3                              | 766.0                                       | 1.0 / <b>765.0</b>                         | - / -  | 0.5 / <b>765.5</b>                          | 2.0 / <b>764.0</b>                                 | 21.0 / <b>745.0</b>                |
| B-4                              | 766.0                                       | 5.0 / <b>761.0</b>                         | - / -  | 2.0 / <b>764.0</b>                          | 4.0 / <b>762.0</b>                                 | 21.0 / <b>745.0</b>                |
| B-5                              | 766.0                                       | 11.5 / <b>754.5</b>                        | - / -  | 0.4 / <b>765.6</b>                          | 8.0 / <b>758.0</b>                                 | 21.0 / <b>745.0</b>                |
| B-6                              | 765.5                                       | 2.5 / <b>763.0</b>                         | - / -  | 2.0 / <b>763.5</b>                          | 6.0 / <b>759.5</b>                                 | 21.0 / <b>744.5</b>                |
| B-7                              | 769.5                                       | 3.0 / <b>766.5</b>                         | - / -  | 2.0 / <b>767.5</b>                          | 6.0 / <b>763.5</b>                                 | 16.0 / <b>753.5</b>                |
| B-8                              | 783.5                                       | 4.0 / <b>779.5</b>                         | 0.5 / <b>783.0</b>                           | - / -                                       | 4.0 / <b>779.5</b>                                 | 21.0 / <b>762.5</b>                |
| <b>Borings performed in 2018</b> |   |  |  |   |  |                                    |
| B-101                            | 764.9                                       | 1.7 / <b>763.2</b>                         | - / -  | 6.0 / <b>758.9</b>                          | - / -  | 16.0 / <b>748.9</b>                |
| B-102                            | 767.0                                       | 2.0 / <b>765.0</b>                         | - / -  | 2.0 / <b>765.0</b>                          | - / -  | 10.0 / <b>757.0</b>                |
| B-103-OW                         | 767.0                                       | 8.9 / <b>758.1</b>                         | - / -  | 2.0 / <b>765.0</b>                          | - / -  | 17.0 / <b>750.0</b>                |
| B-104                            | 767.1                                       | 2.2 / <b>764.9</b>                         | - / -  | 2.0 / <b>765.1</b>                          | - / -  | 16.0 / <b>751.1</b>                |
| B-105                            | 765.2                                       | - / -                                      | - / -  | 0.6 / <b>764.6</b>                          | 6.0 / <b>759.2</b>                                 | 17.0 / <b>748.2</b>                |
| B-106                            | 766.5                                       | 1.8 / <b>764.7</b>                         | - / -  | 0.5 / <b>766.0</b>                          | 6.0 / <b>760.5</b>                                 | 16.0 / <b>750.5</b>                |
| B-107                            | 765.9                                       | 8.0 / <b>757.9</b>                         | - / -  | 4.0 / <b>761.9</b>                          | - / -  | 34.5 / <b>731.4</b>                |
| B-108                            | 763.3                                       | 6.0 / <b>757.3</b>                         | 0.3 / <b>763.0</b>                           | - / -                                       | 4.0 / <b>759.3</b>                                 | 34.1 / <b>729.2</b>                |
| B-109                            | 766.7                                       | 8.0 / <b>758.7</b>                         | 0.2 / <b>766.5</b>                           | - / -                                       | 2.0 / <b>764.7</b>                                 | 36.0 / <b>730.7</b>                |
| B-110-OW                         | 765.4                                       | 13.7 / <b>751.7</b>                        | - / -  | 0.4 / <b>765.0</b>                          | 4.0 / <b>761.4</b>                                 | 35.8 / <b>729.6</b>                |
| B-111                            | 749.6                                       | - / -                                      | 0.3 / <b>749.3</b>                           | - / -                                       | 8.0 / <b>741.6</b>                                 | 15.0 / <b>734.6</b>                |
| B-112                            | 748.6                                       | - / -                                      | 0.2 / <b>748.4</b>                           | - / -                                       | 8.0 / <b>740.6</b>                                 | 15.0 / <b>733.6</b>                |
| B-113 <sup>3</sup>               | 745.7                                       | 14.3 / <b>731.4</b>                        | - / -  | 2.0 / <b>743.7</b>                          | 12.0 / <b>733.7</b>                                | 14.5 / <b>731.2</b>                |
| B-114                            | 745.6                                       | - / -                                      | 0.3 / <b>745.3</b>                           | - / -                                       | 4.0 / <b>741.6</b>                                 | 15.0 / <b>730.6</b>                |
| B-115                            | 741.1                                       | - / -                                      | - / -  | 0.4 / <b>740.7</b>                          | 16.5 / <b>724.6</b>                                | 19.2 / <b>721.9</b>                |
| B-116                            | 767.4                                       | 7.5 / <b>759.9</b>                         | 0.3 / <b>767.1</b>                           | - / -                                       | 4.0 / <b>763.4</b>                                 | 39.0 / <b>728.4</b>                |
| B-117B <sup>3</sup>              | 769.5                                       | 8.0 / <b>761.5</b>                         | - / -  | 2.0 / <b>767.5</b>                          | 8.0 / <b>761.5</b>                                 | 41.0 / <b>728.5</b>                |
| B-118B-OW <sup>3</sup>           | 775.0                                       | 12.5 / <b>762.5</b>                        | - / -  | 2.7 / <b>772.3</b>                          | 6.0 / <b>769.0</b>                                 | 41.0 / <b>734.0</b>                |
| B-119A <sup>3</sup>              | 777.7                                       | 8.0 / <b>769.7</b>                         | - / -  | 4.0 / <b>773.7</b>                          | 8.0 / <b>769.7</b>                                 | 41.0 / <b>736.7</b>                |
| B-120A <sup>3</sup>              | 778.9                                       | 9.0 / <b>769.9</b>                         | - / -  | 0.5 / <b>778.4</b>                          | 8.0 / <b>770.9</b>                                 | 46.0 / <b>732.9</b>                |
| B-121 <sup>3</sup>               | 774.8                                       | 21.0 / <b>753.8</b>                        | 0.2 / <b>774.6</b>                           | - / -                                       | 4.0 / <b>770.8</b>                                 | 27.0 / <b>747.8</b>                |
| B-122 <sup>3</sup>               | 775.8                                       | 18.0 / <b>757.8</b>                        | - / -  | 2.0 / <b>773.8</b>                          | 16.0 / <b>759.8</b>                                | 22.0 / <b>753.8</b>                |
| B-123-OW                         | 788.3                                       | 18.7 / <b>769.6</b>                        | - / -  | 2.4 / <b>785.9</b>                          | 4.0 / <b>784.3</b>                                 | 22.0 / <b>766.3</b>                |
| B-124                            | 784.5                                       | 2.5 / <b>782.0</b>                         | - / -  | 0.6 / <b>783.9</b>                          | 8.0 / <b>776.5</b>                                 | 10.8 / <b>773.7</b>                |
| B-125 <sup>3</sup>               | 782.8                                       | - / -                                      | 0.3 / <b>782.5</b>                           | - / -                                       | 4.0 / <b>778.8</b>                                 | 17.0 / <b>765.8</b>                |
| B-126                            | See Note 5                                  |  |  |   |  |                                    |
| B-127                            | 788.7                                       | 6.1 / <b>782.6</b>                         | - / -  | - / -                                       | - / -  | 26.0 / <b>762.7</b>                |
| B-128-OW                         | 790.5                                       | 9.4 / <b>781.1</b>                         | - / -  | 6.5 / <b>784.0</b>                          | - / -  | 31.0 / <b>759.5</b>                |
| B-129                            | 784.2                                       | 8.0 / <b>776.2</b>                         | - / -  | 8.0 / <b>776.2</b>                          | - / -  | 31.0 / <b>753.2</b>                |
| B-130                            | 768.5                                       | 7.2 / <b>761.3</b>                         | - / -  | 4.0 / <b>764.5</b>                          | - / -  | 30.8 / <b>737.7</b>                |
| B-131 <sup>3</sup>               | 749.4                                       | 25.1 / <b>724.3</b>                        | 0.5 / <b>748.9</b>                           | - / -                                       | 12.0 / <b>737.4</b>                                | 27.4 / <b>722.0</b>                |

1. Ground surface elevations for 2017 test pits interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017. Ground surface elevations for 2018 borings provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.

2. Groundwater generally observed at the end of drilling or based on sample moisture. B-5 measured 15 hours after drilling.

3. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," dated March 26, 2018 and provided to LGCI by Nitsch Engineering, Inc. via email on March 28, 2018.

4. "-" means layer not encountered.

5. Borings not performed due to difficult access.

**Table 1B - Summary of LGCI Test Pits  
Proposed Worcester South High School  
Worcester, Massachusetts  
LGCI Project No. 1644**

| Test Pit No.                       | Ground Surface Elevation (ft.) <sup>1</sup> | Groundwater Depth / El. (ft.) <sup>2</sup> | Bottom of Topsoil / Subsoil Depth / El. (ft.) | Bottom of Fill / Buried Organics Depth / El. (ft.) | Bottom of Test Pit Depth / El. (ft.) |
|------------------------------------|---|--|---|--|--------------------------------------|
| <b>Test pits performed in 2017</b> |   |  |   |  |                                      |
| TP-1                               | 746.5                                       | - / -                                      | 1.0 / <b>745.5</b>                            | - / -  | 8.0 / <b>738.5</b>                   |
| TP-2                               | 752.0                                       | - / -                                      | 0.9 / <b>751.1</b>                            | 3.3 / <b>748.8</b>                                 | 13.0 / <b>739.0</b>                  |
| TP-3                               | 763.5                                       | 9.0 / <b>754.5</b>                         | 0.8 / <b>762.7</b>                            | 3.2 / <b>760.3</b>                                 | 9.0 / <b>754.5</b>                   |
| TP-4                               | 763.0                                       | - / -                                      | 2.5 / <b>760.5</b>                            | - / -  | 12.5 / <b>750.5</b>                  |
| TP-5                               | 766.0                                       | - / -                                      | 2.0 / <b>764.0</b>                            | 6.1 / <b>759.9</b>                                 | 9.5 / <b>756.5</b>                   |
| TP-6                               | 766.0                                       | - / -                                      | 0.8 / <b>765.2</b>                            | 4.7 / <b>761.3</b>                                 | 12.3 / <b>753.7</b>                  |
| TP-7                               | 766.0                                       | - / -                                      | 1.5 / <b>764.5</b>                            | - / -  | 12.0 / <b>754.0</b>                  |
| TP-8                               | 766.0                                       | - / -                                      | 2.1 / <b>763.9</b>                            | - / -  | 10.8 / <b>755.2</b>                  |
| TP-9                               | 766.0                                       | - / -                                      | 2.0 / <b>764.0</b>                            | 4.0 / <b>762.0</b>                                 | 12.7 / <b>753.3</b>                  |
| TP-10                              | 767.0                                       | 8.7 / <b>758.3</b>                         | 2.0 / <b>765.0</b>                            | - / -  | 9.8 / <b>757.2</b>                   |
| TP-11                              | 767.5                                       | - / -                                      | 0.8 / <b>766.7</b>                            | 6.0 / <b>761.5</b>                                 | 9.4 / <b>758.1</b>                   |
| TP-12                              | 769.0                                       | - / -                                      | 0.6 / <b>768.4</b>                            | 2.1 / <b>766.9</b>                                 | 10.0 / <b>759.0</b>                  |
| TP-13                              | 769.5                                       | 10.0 / <b>759.5</b>                        | 1.5 / <b>768.0</b>                            | 6.5 / <b>763.0</b>                                 | 10.1 / <b>759.4</b>                  |
| TP-14                              | 766.0                                       | - / -                                      | 0.8 / <b>765.2</b>                            | 4.0 / <b>762.0</b>                                 | 10.0 / <b>756.0</b>                  |
| <b>Test pits performed in 2018</b> |   |  |   |  |                                      |
| TP-101-IT <sup>3</sup>             | 765.9                                       | - / -                                      | 1.0 / <b>764.9</b>                            | 7.0 / <b>758.9</b>                                 | 13.0 / <b>752.9</b>                  |
| TP-102                             | 766.4                                       | - / -                                      | 1.3 / <b>765.1</b>                            | 6.0 / <b>760.4</b>                                 | 12.5 / <b>753.9</b>                  |
| TP-103                             | 767.0                                       | - / -                                      | 1.3 / <b>765.7</b>                            | 5.0 / <b>762.0</b>                                 | 12.0 / <b>755.0</b>                  |
| TP-104                             | 766.0                                       | - / -                                      | 0.7 / <b>765.3</b>                            | 2.0 / <b>764.0</b>                                 | 12.0 / <b>754.0</b>                  |
| TP-105-IT <sup>3</sup>             | 766.0                                       | 9.0 / <b>757.0</b>                         | 0.8 / <b>765.2</b>                            | 5.0 / <b>761.0</b>                                 | 9.0 / <b>757.0</b>                   |
| TP-106                             | 766.5                                       | - / -                                      | 0.9 / <b>765.6</b>                            | 2.0 / <b>764.5</b>                                 | 11.0 / <b>755.5</b>                  |
| TP-107                             | 767.1                                       | - / -                                      | 0.7 / <b>766.4</b>                            | 1.9 / <b>765.2</b>                                 | 12.0 / <b>755.1</b>                  |
| TP-108                             | 769.0                                       | - / -                                      | 0.8 / <b>768.2</b>                            | 3.5 / <b>765.5</b>                                 | 12.0 / <b>757.0</b>                  |
| TP-109                             | 767.1                                       | 8.8 / <b>758.3</b>                         | 0.8 / <b>766.3</b>                            | 5.0 / <b>762.1</b>                                 | 12.0 / <b>755.1</b>                  |
| TP-110                             | 767.0                                       | - / -                                      | 1.0 / <b>766.0</b>                            | 4.0 / <b>763.0</b>                                 | 12.0 / <b>755.0</b>                  |
| TP-111                             | 766.3                                       | - / -                                      | 0.8 / <b>765.5</b>                            | 7.0 / <b>759.3</b>                                 | 12.0 / <b>754.3</b>                  |
| TP-112                             | 752.5                                       | 3.5 / <b>749.0</b>                         | 3.5 / <b>749.0</b>                            | 8.0 / <b>744.5</b>                                 | 8.5 / <b>744.0</b>                   |
| TP-113                             | 748.0                                       | - / -                                      | 1.5 / <b>746.5</b>                            | 12.0 / <b>736.0</b>                                | 14.0 / <b>734.0</b>                  |
| TP-114                             | 744.6                                       | 3.5 / <b>741.1</b>                         | 1.5 / <b>743.1</b>                            | 12.0 / <b>732.6</b>                                | 12.0 / <b>732.6</b>                  |
| TP-115-IT <sup>3</sup>             | 768.7                                       | 10.5 / <b>758.2</b>                        | 0.8 / <b>767.9</b>                            | 3.0 / <b>765.7</b>                                 | 12.0 / <b>756.7</b>                  |
| TP-116                             | See Note 5                                  |  |   |  |                                      |
| TP-117                             | 769.7                                       | 10.5 / <b>759.2</b>                        | 1.0 / <b>768.7</b>                            | 3.5 / <b>766.2</b>                                 | 12.0 / <b>757.7</b>                  |
| TP-118-IT <sup>3</sup>             | 774.5                                       | - / -                                      | 0.5 / <b>774.0</b>                            | 9.5 / <b>765.0</b>                                 | 9.5 / <b>765.0</b>                   |
| TP-119                             | 783.9                                       | 1.5 / <b>782.4</b>                         | 1.0 / <b>782.9</b>                            | 3.0 / <b>780.9</b>                                 | 12.0 / <b>771.9</b>                  |
| TP-120                             | 786.8                                       | - / -                                      | 2.5 / <b>784.3</b>                            | 5.0 / <b>781.8</b>                                 | 12.0 / <b>774.8</b>                  |
| TP-121-IT <sup>3</sup>             | 784.0                                       | - / -                                      | 2.0 / <b>782.0</b>                            | 3.0 / <b>781.0</b>                                 | 12.0 / <b>772.0</b>                  |
| TP-122                             | 784.2                                       | - / -                                      | 1.5 / <b>782.7</b>                            | 8.5 / <b>775.7</b>                                 | 8.5 / <b>775.7</b>                   |
| TP-123                             | See Note 5                                  |  |   |  |                                      |
| TP-124                             | 789.7                                       | 5.0 / <b>784.7</b>                         | 1.0 / <b>788.7</b>                            | 7.0 / <b>782.7</b>                                 | 12.0 / <b>777.7</b>                  |
| TP-125                             | 789.5                                       | 1.5 / <b>788.0</b>                         | 1.5 / <b>788.0</b>                            | - / -  | 12.5 / <b>777.0</b>                  |
| TP-126                             | 761.9                                       | - / -                                      | 5.8 / <b>756.1</b>                            | - / -  | 12.0 / <b>749.9</b>                  |
| TP-127                             | 749.0                                       | - / -                                      | 2.5 / <b>746.5</b>                            | - / -  | 12.0 / <b>737.0</b>                  |
| TP-128                             | 751.4                                       | - / -                                      | 3.3 / <b>748.1</b>                            | - / -  | 12.0 / <b>739.4</b>                  |

1. Ground surface elevations for 2017 test pits interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017. Ground surface elevations for 2018 test pits provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
2. Groundwater observed seeping into the test pit excavation.
3. Infiltration test was performed at this location by a LGCI engineer.
4. "-" means layer not encountered.
5. Test pit not performed due to conflict with water line.

**Table 2A - Summary of LGCI Borings - Proposed Building  
Proposed Worcester South High School  
Worcester, Massachusetts  
LGCI Project No. 1644**

| Boring No. | Ground Surface Elevation (ft.) <sup>1</sup> | Groundwater Depth / El. (ft.) <sup>2</sup> | Bottom of Asphalt/Concrete Depth / El. (ft.) | Bottom of Topsoil/Subsoil Depth / El. (ft.) | Bottom of Fill / Buried Organics Depth / El. (ft.) | Bottom of Boring Depth / El. (ft.) |
|------------|---|--|--|---|--|------------------------------------|
|------------|---|--|--|---|--|------------------------------------|

| <b>Borings performed in 2017</b> |       |                     |                    |                    |                     |                     |
|----------------------------------|-------|---------------------|--------------------|--------------------|---------------------|---------------------|
| B-1                              | 746.0 | 3.5 / <b>742.5</b>  | 0.5 / <b>745.5</b> | - / -              | 12.0 / <b>734.0</b> | 17.0 / <b>729.0</b> |
| B-2                              | 766.0 | 4.5 / <b>761.5</b>  | - / -              | 2.0 / <b>764.0</b> | - / -               | 21.0 / <b>745.0</b> |
| B-3                              | 766.0 | 1.0 / <b>765.0</b>  | - / -              | 0.5 / <b>765.5</b> | 2.0 / <b>764.0</b>  | 21.0 / <b>745.0</b> |
| B-4                              | 766.0 | 5.0 / <b>761.0</b>  | - / -              | 2.0 / <b>764.0</b> | 4.0 / <b>762.0</b>  | 21.0 / <b>745.0</b> |
| B-5                              | 766.0 | 11.5 / <b>754.5</b> | - / -              | 0.4 / <b>765.6</b> | 8.0 / <b>758.0</b>  | 21.0 / <b>745.0</b> |
| B-6                              | 765.5 | 2.5 / <b>763.0</b>  | - / -              | 2.0 / <b>763.5</b> | 6.0 / <b>759.5</b>  | 21.0 / <b>744.5</b> |
| <b>Borings performed in 2018</b> |       |                     |                    |                    |                     |                     |
| B-101                            | 764.9 | 1.7 / <b>763.2</b>  | - / -              | 6.0 / <b>758.9</b> | - / -               | 16.0 / <b>748.9</b> |
| B-102                            | 767.0 | 2.0 / <b>765.0</b>  | - / -              | 2.0 / <b>765.0</b> | - / -               | 10.0 / <b>757.0</b> |
| B-103-OW                         | 767.0 | 8.9 / <b>758.1</b>  | - / -              | 2.0 / <b>765.0</b> | - / -               | 17.0 / <b>750.0</b> |
| B-104                            | 767.1 | 2.2 / <b>764.9</b>  | - / -              | 2.0 / <b>765.1</b> | - / -               | 16.0 / <b>751.1</b> |
| B-105                            | 765.2 | - / -               | - / -              | 0.6 / <b>764.6</b> | 6.0 / <b>759.2</b>  | 17.0 / <b>748.2</b> |
| B-106                            | 766.5 | 1.8 / <b>764.7</b>  | - / -              | 0.5 / <b>766.0</b> | 6.0 / <b>760.5</b>  | 16.0 / <b>750.5</b> |
| B-107                            | 765.9 | 8.0 / <b>757.9</b>  | - / -              | 4.0 / <b>761.9</b> | - / -               | 34.5 / <b>731.4</b> |
| B-108                            | 763.3 | 6.0 / <b>757.3</b>  | 0.3 / <b>763.0</b> | - / -              | 4.0 / <b>759.3</b>  | 34.1 / <b>729.2</b> |
| B-109                            | 766.7 | 8.0 / <b>758.7</b>  | 0.2 / <b>766.5</b> | - / -              | 2.0 / <b>764.7</b>  | 36.0 / <b>730.7</b> |
| B-110-OW                         | 765.4 | 13.7 / <b>751.7</b> | - / -              | 0.4 / <b>765.0</b> | 4.0 / <b>761.4</b>  | 35.8 / <b>729.6</b> |
| B-111                            | 749.6 | - / -               | 0.3 / <b>749.3</b> | - / -              | 8.0 / <b>741.6</b>  | 15.0 / <b>734.6</b> |
| B-112                            | 748.6 | - / -               | 0.2 / <b>748.4</b> | - / -              | 8.0 / <b>740.6</b>  | 15.0 / <b>733.6</b> |
| B-113 <sup>3</sup>               | 745.7 | 14.3 / <b>731.4</b> | - / -              | 2.0 / <b>743.7</b> | 12.0 / <b>733.7</b> | 14.5 / <b>731.2</b> |
| B-114                            | 745.6 | - / -               | 0.3 / <b>745.3</b> | - / -              | 4.0 / <b>741.6</b>  | 15.0 / <b>730.6</b> |
| B-116                            | 767.4 | 7.5 / <b>759.9</b>  | 0.3 / <b>767.1</b> | - / -              | 4.0 / <b>763.4</b>  | 39.0 / <b>728.4</b> |
| B-117B <sup>3</sup>              | 769.5 | 8.0 / <b>761.5</b>  | - / -              | 2.0 / <b>767.5</b> | 8.0 / <b>761.5</b>  | 41.0 / <b>728.5</b> |
| B-118B-OW <sup>3</sup>           | 775.0 | 12.5 / <b>762.5</b> | - / -              | 2.7 / <b>772.3</b> | 6.0 / <b>769.0</b>  | 41.0 / <b>734.0</b> |
| B-119A <sup>3</sup>              | 777.7 | 8.0 / <b>769.7</b>  | - / -              | 4.0 / <b>773.7</b> | 8.0 / <b>769.7</b>  | 41.0 / <b>736.7</b> |
| B-131 <sup>3</sup>               | 749.4 | 25.1 / <b>724.3</b> | 0.5 / <b>748.9</b> | - / -              | 12.0 / <b>737.4</b> | 27.4 / <b>722.0</b> |

1. Ground surface elevations for 2017 test pits interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017. Ground surface elevations for 2018 borings provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
2. Groundwater generally observed at the end of drilling or based on sample moisture. B-5 measured 15 hours after drilling.
3. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," dated March 26, 2018 and provided to LGCI by Nitsch Engineering, Inc. via email on March 28, 2018.
4. "-" means layer not encountered.

**Table 2B - Summary of LGCI Test Pits - Proposed Building  
Proposed Worcester South High School  
Worcester, Massachusetts  
LGCI Project No. 1644**

| Test Pit No. | Ground Surface Elevation (ft.) <sup>1</sup> | Groundwater Depth / El. (ft.) <sup>2</sup> | Bottom of Topsoil / Subsoil Depth / El. (ft.) | Bottom of Fill / Buried Organics Depth / El. (ft.) | Bottom of Test Pit Depth / El. (ft.) |
|--------------|---|--|---|--|--------------------------------------|
|--------------|---|--|---|--|--------------------------------------|

| <b>Test pits performed in 2017</b> |       |                    |                    |                     |                     |
|------------------------------------|-------|--------------------|--------------------|---------------------|---------------------|
| TP-1                               | 746.5 | - / -              | 1.0 / <b>745.5</b> | - / -               | 8.0 / <b>738.5</b>  |
| TP-2                               | 752.0 | - / -              | 0.9 / <b>751.1</b> | 3.3 / <b>748.8</b>  | 13.0 / <b>739.0</b> |
| TP-3                               | 763.5 | 9.0 / <b>754.5</b> | 0.8 / <b>762.7</b> | 3.2 / <b>760.3</b>  | 9.0 / <b>754.5</b>  |
| TP-4                               | 763.0 | - / -              | 2.5 / <b>760.5</b> | - / -               | 12.5 / <b>750.5</b> |
| TP-5                               | 766.0 | - / -              | 2.0 / <b>764.0</b> | 6.1 / <b>759.9</b>  | 9.5 / <b>756.5</b>  |
| TP-6                               | 766.0 | - / -              | 0.8 / <b>765.2</b> | 4.7 / <b>761.3</b>  | 12.3 / <b>753.7</b> |
| TP-7                               | 766.0 | - / -              | 1.5 / <b>764.5</b> | - / -               | 12.0 / <b>754.0</b> |
| TP-8                               | 766.0 | - / -              | 2.1 / <b>763.9</b> | - / -               | 10.8 / <b>755.2</b> |
| TP-9                               | 766.0 | - / -              | 2.0 / <b>764.0</b> | 4.0 / <b>762.0</b>  | 12.7 / <b>753.3</b> |
| TP-14                              | 766.0 | - / -              | 0.8 / <b>765.2</b> | 4.0 / <b>762.0</b>  | 10.0 / <b>756.0</b> |
| <b>Test pits performed in 2018</b> |       |                    |                    |                     |                     |
| TP-101 <sup>3</sup>                | 765.9 | - / -              | 1.0 / <b>764.9</b> | 7.0 / <b>758.9</b>  | 13.0 / <b>752.9</b> |
| TP-102                             | 766.4 | - / -              | 1.3 / <b>765.1</b> | 6.0 / <b>760.4</b>  | 12.5 / <b>753.9</b> |
| TP-103                             | 767.0 | - / -              | 1.3 / <b>765.7</b> | 5.0 / <b>762.0</b>  | 12.0 / <b>755.0</b> |
| TP-104                             | 766.0 | - / -              | 0.7 / <b>765.3</b> | 2.0 / <b>764.0</b>  | 12.0 / <b>754.0</b> |
| TP-105 <sup>3</sup>                | 766.0 | 9.0 / <b>757.0</b> | 0.8 / <b>765.2</b> | 5.0 / <b>761.0</b>  | 9.0 / <b>757.0</b>  |
| TP-106                             | 766.5 | - / -              | 0.9 / <b>765.6</b> | 2.0 / <b>764.5</b>  | 11.0 / <b>755.5</b> |
| TP-107                             | 767.1 | - / -              | 0.7 / <b>766.4</b> | 1.9 / <b>765.2</b>  | 12.0 / <b>755.1</b> |
| TP-109                             | 767.1 | 8.8 / <b>758.3</b> | 0.8 / <b>766.3</b> | 5.0 / <b>762.1</b>  | 12.0 / <b>755.1</b> |
| TP-110                             | 767.0 | - / -              | 1.0 / <b>766.0</b> | 4.0 / <b>763.0</b>  | 12.0 / <b>755.0</b> |
| TP-111                             | 766.3 | - / -              | 0.8 / <b>765.5</b> | 7.0 / <b>759.3</b>  | 12.0 / <b>754.3</b> |
| TP-112                             | 752.5 | 3.5 / <b>749.0</b> | 3.5 / <b>749.0</b> | 8.0 / <b>744.5</b>  | 8.5 / <b>744.0</b>  |
| TP-113                             | 748.0 | - / -              | 1.5 / <b>746.5</b> | 12.0 / <b>736.0</b> | 14.0 / <b>734.0</b> |

1. Ground surface elevations for 2017 test pits interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017. Ground surface elevations for 2018 test pits provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.

2. Groundwater observed seeping into the test pit excavation.

3. Infiltrometer test was performed at this location by a LGCI engineer.

4. "-" means layer not encountered.

**Table 3A - Summary of LGCI Borings - Proposed Retaining Wall on Southern Side  
Proposed Worcester South High School  
Worcester, Massachusetts  
LGCI Project No. 1644**

| Boring No. | Ground Surface<br>Elevation (ft.) <sup>1</sup> | Groundwater<br>Depth / El. (ft.) <sup>2</sup> | Bottom of<br>Asphalt/Concrete<br>Depth / El. (ft.) | Bottom of<br>Topsoil/Subsoil<br>Depth / El. (ft.) | Bottom of Fill /<br>Buried Organics<br>Depth / El. (ft.) | Bottom of<br>Boring<br>Depth / El. (ft.) |
|------------|--|---|--|---|--|--|
|------------|--|---|--|---|--|--|

| Borings performed in 2018 |       |                    |                    |                    |                    |                     |
|---------------------------|-------|--------------------|--------------------|--------------------|--------------------|---------------------|
| B-125 <sup>3</sup>        | 782.8 | - / -              | 0.3 / <b>782.5</b> | - / -              | 4.0 / <b>778.8</b> | 17.0 / <b>765.8</b> |
| B-127                     | 788.7 | 6.1 / <b>782.6</b> | - / -              | - / -              | - / -              | 26.0 / <b>762.7</b> |
| B-128-OW                  | 790.5 | 9.4 / <b>781.1</b> | - / -              | 6.5 / <b>784.0</b> | - / -              | 31.0 / <b>759.5</b> |
| B-129                     | 784.2 | 8.0 / <b>776.2</b> | - / -              | 8.0 / <b>776.2</b> | - / -              | 31.0 / <b>753.2</b> |
| B-130                     | 768.5 | 7.2 / <b>761.3</b> | - / -              | 4.0 / <b>764.5</b> | - / -              | 30.8 / <b>737.7</b> |

1. Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
2. Groundwater generally observed at the end of drilling or based on sample moisture. B-5 measured 15 hours after drilling.
3. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," dated March 26, 2018 and provided to LGCI by Nitsch Engineering, Inc. via email on March 28, 2018.
4. "-" means layer not encountered.



**Table 3B - Summary of LGCI Test Pits - Proposed Retaining Wall on Southern Side  
Proposed Worcester South High School  
Worcester, Massachusetts  
LGCI Project No. 1644**

| Test Pit No. | Ground Surface<br>Elevation (ft.) <sup>1</sup> | Groundwater<br>Depth / El. (ft.) <sup>2</sup> | Bottom of<br>Topsoil / Subsoil<br>Depth / El. (ft.) | Bottom of Fill /<br>Buried<br>Organics<br>Depth / El. (ft.) | Bottom of<br>Test Pit<br>Depth / El. (ft.) |
|--------------|--|---|---|---|--|
|--------------|--|---|---|---|--|

| <b>Test pits performed in 2018</b> |       |                    |                    |                    |                     |
|------------------------------------|-------|--------------------|--------------------|--------------------|---------------------|
| TP-119                             | 783.9 | 1.5 / <b>782.4</b> | 1.0 / <b>782.9</b> | 3.0 / <b>780.9</b> | 12.0 / <b>771.9</b> |
| TP-124                             | 789.7 | 5.0 / <b>784.7</b> | 1.0 / <b>788.7</b> | 7.0 / <b>782.7</b> | 12.0 / <b>777.7</b> |
| TP-125                             | 789.5 | 1.5 / <b>788.0</b> | 1.5 / <b>788.0</b> | - / -              | 12.5 / <b>777.0</b> |

1. Ground surface elevations for 2018 test pits provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
2. Groundwater observed seeping into the test pit excavation.
3. "-" means layer not encountered.

**Table 4A - Summary of LGCI Borings - Proposed Parking Lots, Driveways, and A  
Proposed Worcester South High School  
Worcester, Massachusetts  
LGCI Project No. 1644**

| Boring No. | Ground Surface<br>Elevation (ft.) <sup>1</sup> | Groundwater<br>Depth / El. (ft.) <sup>2</sup> | Bottom of<br>Asphalt/Concrete<br>Depth / El. (ft.) | Bottom of<br>Topsoil/Subsoil<br>Depth / El. (ft.) | Bottom of Fill /<br>Buried Organics<br>Depth / El. (ft.) | Bottom of<br>Boring<br>Depth / El. (ft.) |
|------------|--|---|--|---|--|--|
|------------|--|---|--|---|--|--|

| <b>Borings performed in 2017</b> |       |                     |                    |                    |                     |                     |
|----------------------------------|-------|---------------------|--------------------|--------------------|---------------------|---------------------|
| B-7 <sup>3</sup>                 | 769.5 | 3.0 / <b>766.5</b>  | - / -              | 2.0 / <b>767.5</b> | 6.0 / <b>763.5</b>  | 16.0 / <b>753.5</b> |
| B-8 <sup>3</sup>                 | 783.5 | 4.0 / <b>779.5</b>  | 0.5 / <b>783.0</b> | - / -              | 4.0 / <b>779.5</b>  | 21.0 / <b>762.5</b> |
| <b>Borings performed in 2018</b> |       |                     |                    |                    |                     |                     |
| B-115                            | 741.1 | - / -               | - / -              | 0.4 / <b>740.7</b> | 16.5 / <b>724.6</b> | 19.2 / <b>721.9</b> |
| B-120 <sup>3</sup>               | 778.9 | 9.0 / <b>769.9</b>  | - / -              | 0.5 / <b>778.4</b> | 8.0 / <b>770.9</b>  | 46.0 / <b>732.9</b> |
| B-121 <sup>3</sup>               | 774.8 | 21.0 / <b>753.8</b> | 0.2 / <b>774.6</b> | - / -              | 4.0 / <b>770.8</b>  | 27.0 / <b>747.8</b> |
| B-122 <sup>3</sup>               | 775.8 | 18.0 / <b>757.8</b> | - / -              | 2.0 / <b>773.8</b> | 16.0 / <b>759.8</b> | 22.0 / <b>753.8</b> |
| B-123-OW                         | 788.3 | 18.7 / <b>769.6</b> | - / -              | 2.4 / <b>785.9</b> | 4.0 / <b>784.3</b>  | 22.0 / <b>766.3</b> |
| B-124                            | 784.5 | 2.5 / <b>782.0</b>  | - / -              | 0.6 / <b>783.9</b> | 8.0 / <b>776.5</b>  | 10.8 / <b>773.7</b> |

1. Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.

2. Groundwater generally observed at the end of drilling or based on sample moisture. B-5 measured 15 hours after drilling.

3. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," dated March 26, 2018 and provided to LGCI by Nitsch Engineering, Inc. via email on March 28, 2018.

4. "-" means layer not encountered.

**Table 4B - Summary of LGCI Test Pits - Proposed Parking Lots, D  
Proposed Worcester South High School  
Worcester, Massachusetts  
LGCI Project No. 1644**

| Test Pit No. | Ground Surface<br>Elevation (ft.) <sup>1</sup> | Groundwater<br>Depth / El. (ft.) <sup>2</sup> | Bottom of<br>Topsoil / Subsoil<br>Depth / El. (ft.) | Bottom of Fill /<br>Buried<br>Organics<br>Depth / El. (ft.) | Bottom of<br>Test Pit<br>Depth / El. (ft.) |
|--------------|--|---|---|---|--|
|--------------|--|---|---|---|--|

| <b>Test pits performed in 2017</b> |       |                     |                    |                    |                     |
|------------------------------------|-------|---------------------|--------------------|--------------------|---------------------|
| TP-10                              | 767.0 | 8.7 / <b>758.3</b>  | 2.0 / <b>765.0</b> | - / -              | 9.8 / <b>757.2</b>  |
| TP-11                              | 767.5 | - / -               | 0.8 / <b>766.7</b> | 6.0 / <b>761.5</b> | 9.4 / <b>758.1</b>  |
| TP-12                              | 769.0 | - / -               | 0.6 / <b>768.4</b> | 2.1 / <b>766.9</b> | 10.0 / <b>759.0</b> |
| TP-13                              | 769.5 | 10.0 / <b>759.5</b> | 1.5 / <b>768.0</b> | 6.5 / <b>763.0</b> | 10.1 / <b>759.4</b> |
| TP-14                              | 766.0 | - / -               | 0.8 / <b>765.2</b> | 4.0 / <b>762.0</b> | 10.0 / <b>756.0</b> |
| <b>Test pits performed in 2018</b> |       |                     |                    |                    |                     |
| TP-108                             | 769.0 | - / -               | 0.8 / <b>768.2</b> | 3.5 / <b>765.5</b> | 12.0 / <b>757.0</b> |
| TP-115 <sup>3</sup>                | 768.7 | 10.5 / <b>758.2</b> | 0.8 / <b>767.9</b> | 3.0 / <b>765.7</b> | 12.0 / <b>756.7</b> |
| TP-116                             | -     | - / -               | - / -              | - / -              | - / -               |
| TP-117                             | 769.7 | 10.5 / <b>759.2</b> | 1.0 / <b>768.7</b> | 3.5 / <b>766.2</b> | 12.0 / <b>757.7</b> |
| TP-118 <sup>3</sup>                | 774.5 | - / -               | 0.5 / <b>774.0</b> | 9.5 / <b>765.0</b> | 9.5 / <b>765.0</b>  |
| TP-120                             | 786.8 | - / -               | 2.5 / <b>784.3</b> | 5.0 / <b>781.8</b> | 12.0 / <b>774.8</b> |
| TP-121 <sup>3</sup>                | 784.0 | - / -               | 2.0 / <b>782.0</b> | 3.0 / <b>781.0</b> | 12.0 / <b>772.0</b> |
| TP-122                             | 784.2 | - / -               | 1.5 / <b>782.7</b> | 8.5 / <b>775.7</b> | 8.5 / <b>775.7</b>  |
| TP-126                             | 761.9 | - / -               | 5.8 / <b>756.1</b> | - / -              | 12.0 / <b>749.9</b> |
| TP-127                             | 749.0 | - / -               | 2.5 / <b>746.5</b> | - / -              | 12.0 / <b>737.0</b> |
| TP-128                             | 751.4 | - / -               | 3.3 / <b>748.1</b> | - / -              | 12.0 / <b>739.4</b> |

1. Ground surface elevations for 2017 test pits interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017. Ground surface elevations for 2018 test pits provided in a drawing titled: "Boring Location Plan, South High Community School Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
2. Groundwater observed seeping into the test pit excavation.
3. Infiltrometer test was performed at this location by a LGCI engineer.
4. "-" means layer not encountered.

**Table 5- Summary of LGCI Groundwater Measurements  
Proposed Worcester South High School  
Worcester, Massachusetts  
LGCI Project No. 1644**

| Date | B-103-OW <sup>1</sup> | B-110-OW <sup>1</sup> | B-118B-OW <sup>2</sup> | B-123-OW <sup>1</sup> | B-128-OW <sup>1</sup> |
|------|-----------------------|-----------------------|------------------------|-----------------------|-----------------------|
|      | G.S. El.= 767.0 ft.   | G.S. El.= 765.4 ft.   | G.S. El.= 775.0 ft.    | G.S. El.= 788.3 ft.   | G.S. El.= 790.5 ft.   |

|           | Depth / Elevation<br>(ft.) | Depth / Elevation<br>(ft.) | Depth / Elevation<br>(ft.) | Depth / Elevation<br>(ft.) | Depth / Elevation<br>(ft.) |
|-----------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| 2/14/2018 | 14.2 / <b>752.8</b>        | - / -                      | - / -                      | - / -                      | - / -                      |
| 2/15/2018 | 8.9 / <b>758.1</b>         | - / -                      | - / -                      | - / -                      | 9.4 / <b>781.1</b>         |
| 2/21/2018 | 8.7 / <b>758.3</b>         | - / -                      | - / -                      | - / -                      | 11.5 / <b>779.0</b>        |
| 2/22/2018 | 8.3 / <b>758.7</b>         | - / -                      | - / -                      | - / -                      | - / -                      |
| 2/23/2018 | - / -                      | - / -                      | - / -                      | 8.3 / <b>780.0</b>         | - / -                      |
| 2/26/2018 | 6.2 / <b>760.8</b>         | 13.7 / <b>751.7</b>        | - / -                      | 15.0 / <b>773.3</b>        | 11.9 / <b>778.6</b>        |
| 2/27/2018 | 6.0 / <b>761.0</b>         | 13.2 / <b>752.2</b>        | - / -                      | 14.9 / <b>773.4</b>        | 11.8 / <b>778.7</b>        |
| 2/28/2018 | 5.9 / <b>761.1</b>         | 13.1 / <b>752.3</b>        | 12.8 / <b>762.2</b>        | 14.9 / <b>773.4</b>        | 11.9 / <b>778.6</b>        |
| 3/1/2018  | 5.9 / <b>761.1</b>         | 13.2 / <b>752.2</b>        | 12.9 / <b>762.1</b>        | 15.0 / <b>773.3</b>        | 11.8 / <b>778.7</b>        |

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
2. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," dated March 26, 2018 and provided to LGCI by Nitsch Engineering, Inc. via email on March 28, 2018.



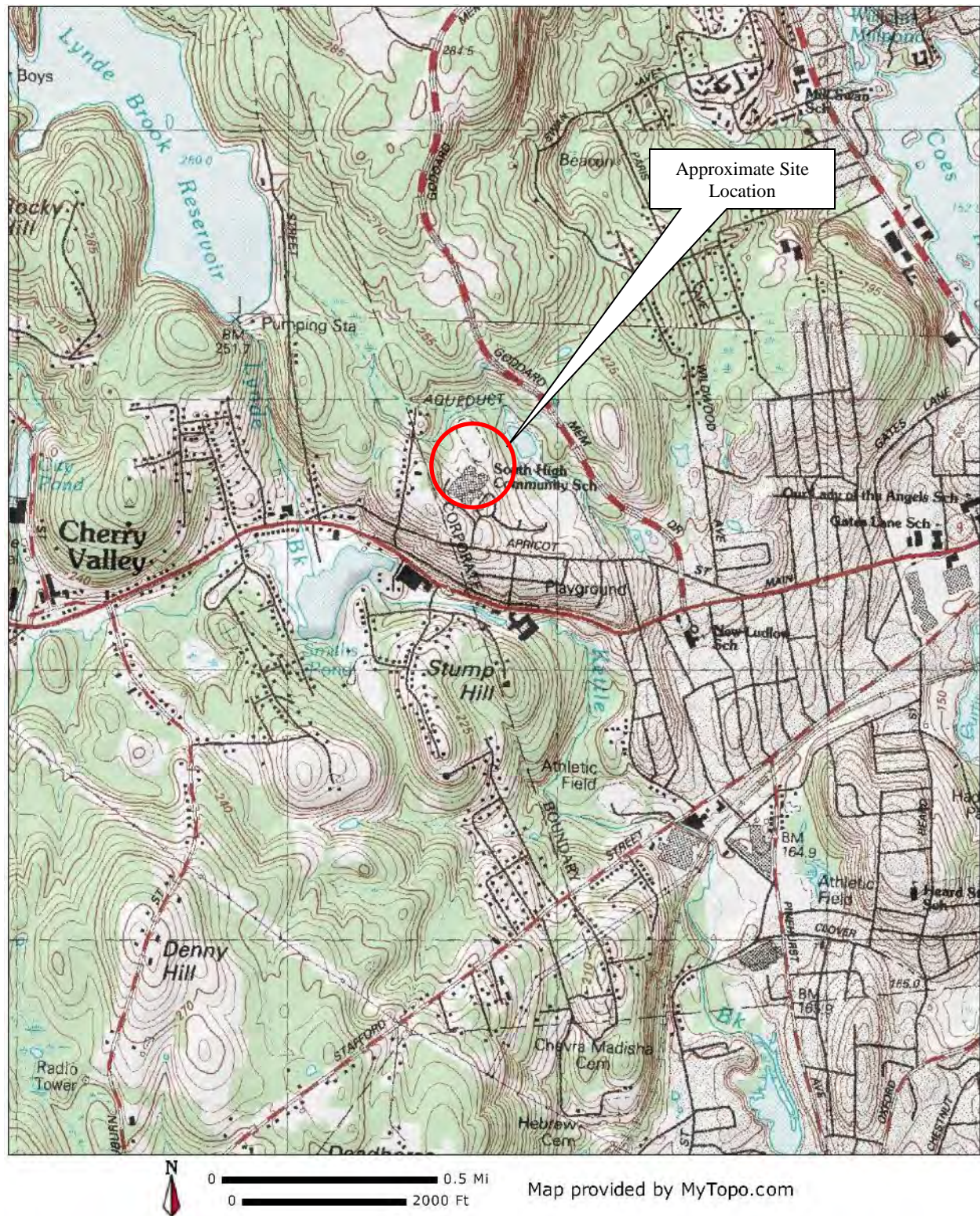


Figure based on USGS topographic map of Worcester, MA obtained from [www.mytopo.com/maps](http://www.mytopo.com/maps)



|   |   |                                     |                            |
|---|---|-------------------------------------|----------------------------|
| Client:<br><b>Lamoureux Pagano &amp; Associates, Inc.</b>   | Project:<br><b>Proposed Worcester South High School</b> | <b>Figure 1 – Site Location Map</b> |                            |
|  <b>LGCI</b><br>Lahlaf Geotechnical Consulting, Inc. | Project Location:<br><b>Worcester, MA</b>               | LGCI Project No.:<br><b>1644</b>    | Date:<br><b>April 2018</b> |

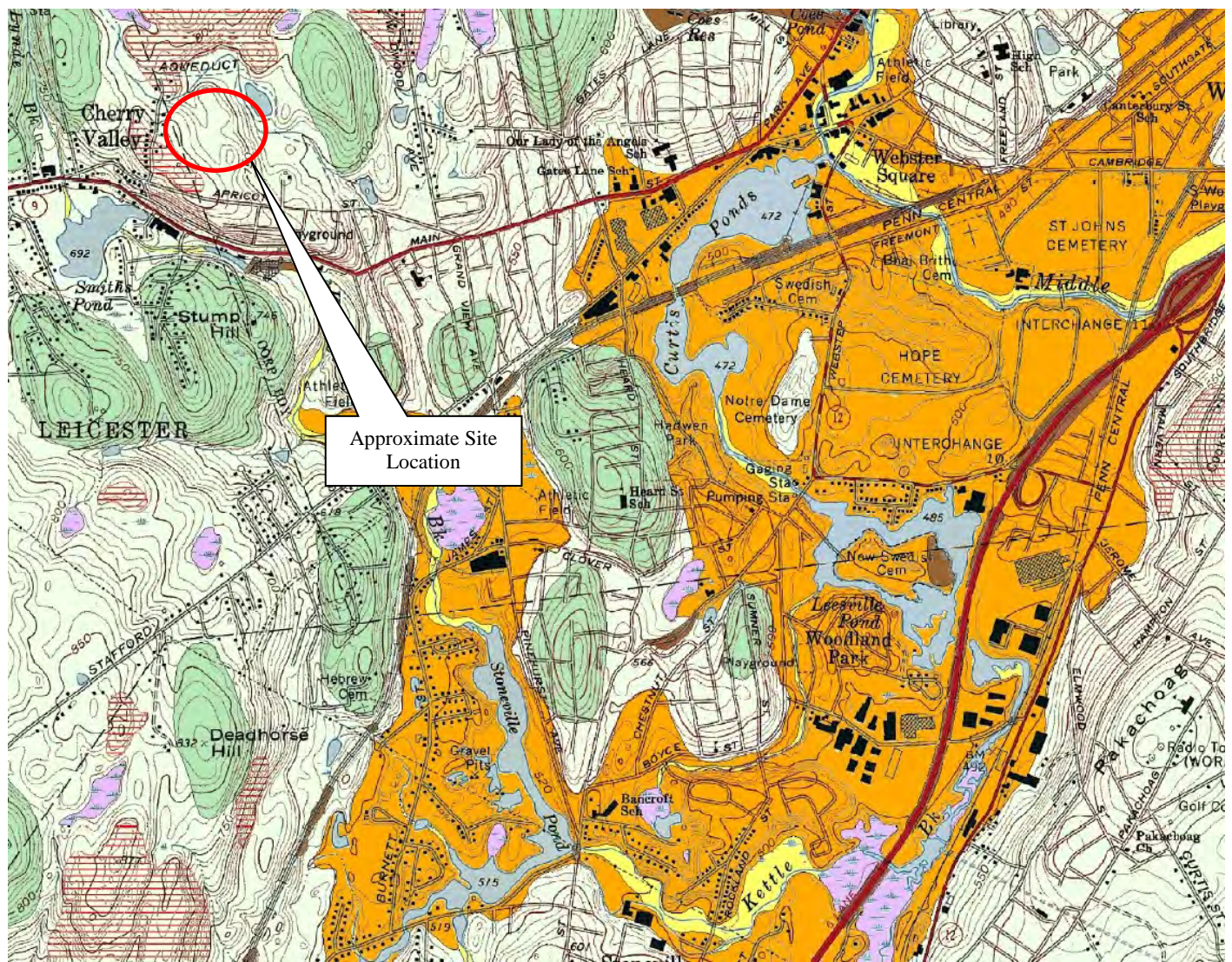




Figure based aerial photograph of site obtained [www.google.com/maps](http://www.google.com/maps)


|   |   |   |                     |
|---|---|---|---------------------|
| Client:<br>Lamoureux Pagano &<br>Associates, Inc.   | Project:<br>Proposed Worcester South<br>High School | Figure 2 – Aerial View of<br>Existing School Site |                     |
|  <b>LGCI</b><br>Lahlaf Geotechnical Consulting, Inc. | Project Location:<br>Worcester, MA                  | LGCI Project No.:<br>1644                         | Date:<br>April 2018 |





**Thin till**—Nonsorted, nonstratified matrix of sand, some silt, and little clay containing scattered gravel clasts and few large boulders; predominantly upper till of the last glaciation; loose to moderately compact, generally sandy, commonly stony. Two facies are present in some places: a looser, coarser-grained ablation facies, melted out from supraglacial position; and an underlying more compact, finer-grained lodgement facies deposited subglacially. Both ablation and lodgement facies of upper till are sandy and stony, and derived from coarse-grained crystalline rocks. Unit includes till of probable Illinoian age beneath eastern Nantucket (Oldale and others, 1982). Beneath Cape Cod, subsurface till overlies fresh, nonweathered bedrock; this basal till varies in known thickness from <5 to >50 ft (Cotton and Koteff, 1962; Masterson and others, 1997; Folger and others, 1978; Hall and others, 1980). Till may overlie Cretaceous, Tertiary, or older Pleistocene deposits beneath the adjacent islands

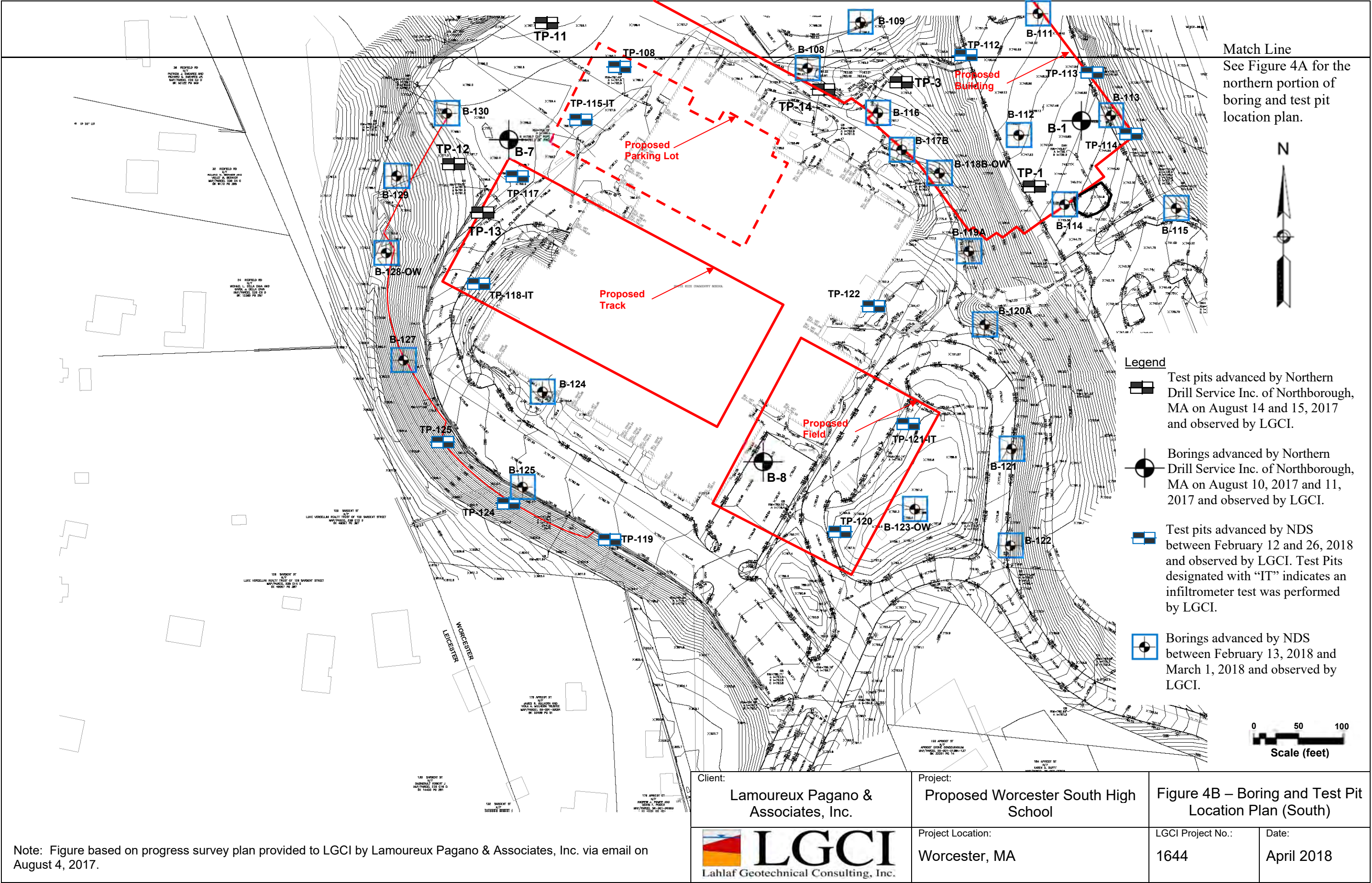
Figure based on map titled: "Surficial Geologic Map of the Worcester South Quadrangle, Massachusetts," prepared by Stone, B.D., Stone, J.R., and DiGiacomo-Cohen, M.L. for U.S. Geological Survey, Open-File Report 2006-1260-D, 2008.

|   |  |                                   |                     |
|---|--|-----------------------------------|---------------------|
| Client:<br>Lamoureux Pagano & Associates, Inc.  | Project:<br>Proposed Worcester South High School | Figure 3 – Surficial Geologic Map |                     |
|  <b>LGCI</b><br>Lahlaf Geotechnical Consulting, Inc. | Project Location:<br>Worcester, MA               | LGCI Project No.:<br>1644         | Date:<br>April 2018 |








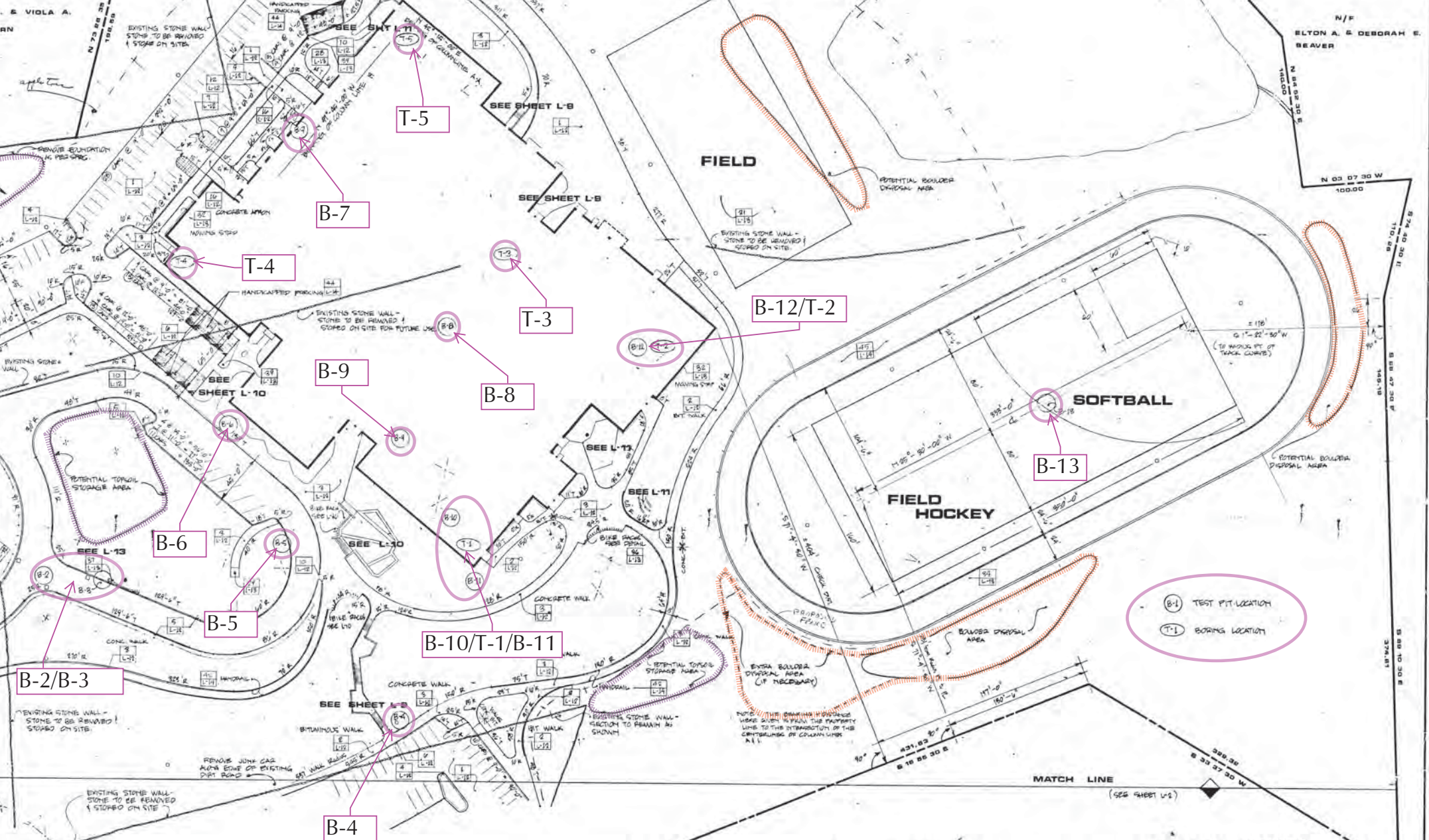


Note: Figure based on progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.

|   |  |  |  |   |                     |
|---|--|--|--|---|---------------------|
| Client:<br>Lamoureux Pagano & Associates, Inc.  |  | Project:<br>Proposed Worcester South High School |  | Figure 4B – Boring and Test Pit Location Plan (South) |                     |
| <br>Lahlaf Geotechnical Consulting, Inc. |  | Project Location:<br>Worcester, MA               |  | LGCI Project No.:<br>1644                             | Date:<br>April 2018 |

## **APPENDIX A - Logs of Previous Borings and Test Pits**





NOTE: FOR LEGEND AND PARTIAL NOTES SEE SHEET L-2



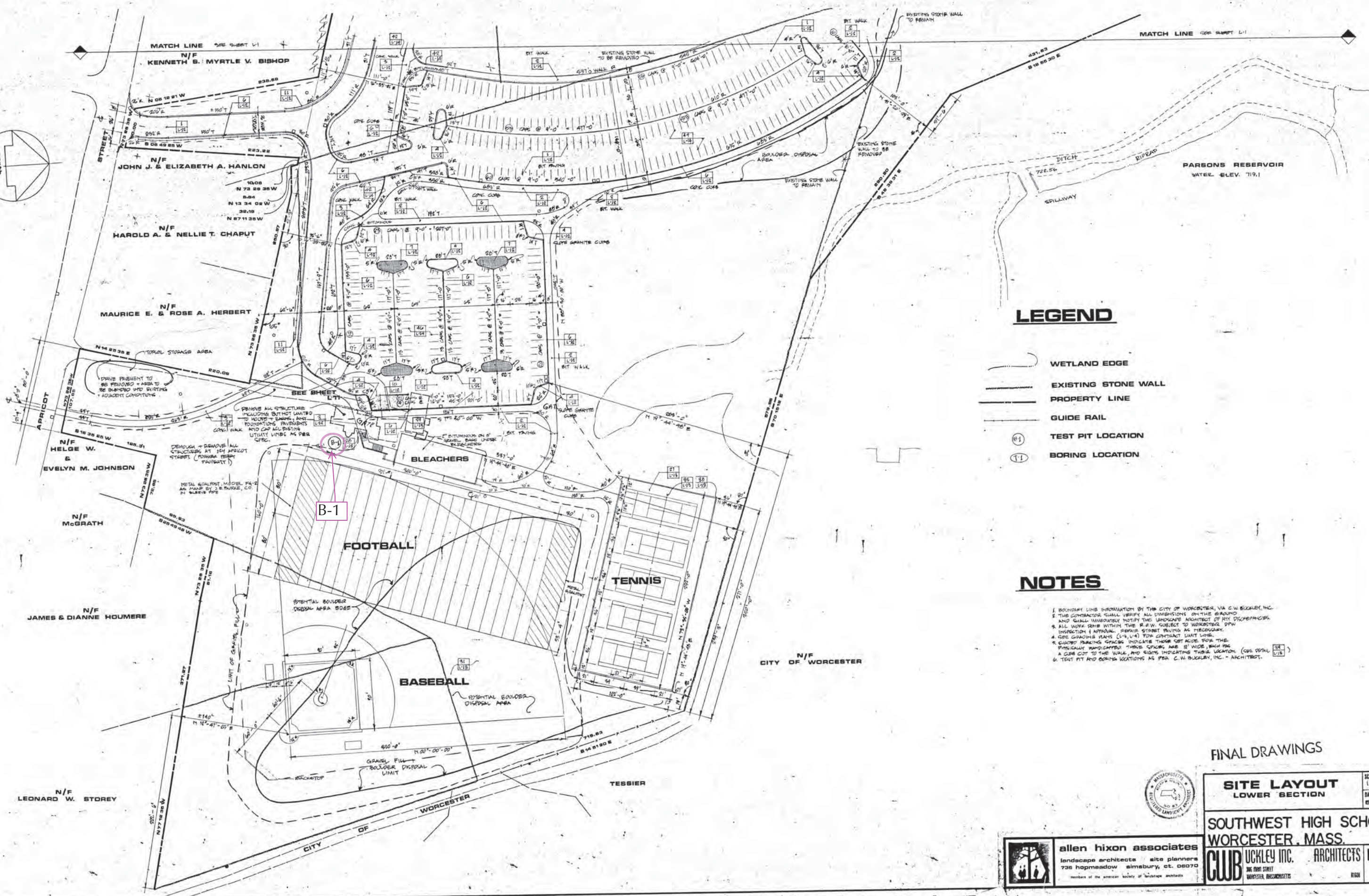
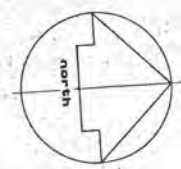
# FINAL DRAWINGS

|  |  |  |
|--|--|--|
| <p><b>SITE LAYOUT</b><br/>UPPER SECTION</p>              |  | <p>SCALE<br/>1"=40'-0"</p>                           |
| <p><b>SOUTHWEST HIGH SCHOOL</b><br/>WORCESTER, MASS.</p> |  | <p>DATE<br/>5-17-76</p>                              |
| <p><b>CLUB</b> UCKLEY INC. ARCHITECTS</p>                |  | <p>205 BROAD STREET<br/>WORCESTER, MASSACHUSETTS</p> |



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**LEGEND**

- WETLAND EDGE
- EXISTING STONE WALL
- PROPERTY LINE
- GUIDE RAIL
- TEST PIT LOCATION
- BORING LOCATION

**NOTES**

1. BOUNDARY LINE INFORMATION BY THE CITY OF WORCESTER, VIA C.W. BUCKLEY, INC.
2. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS ON THE GROUND AND SHALL IMMEDIATELY NOTIFY THE LANDSCAPE ARCHITECT OF ANY DISCREPANCIES.
3. ALL WORK SHALL BE WITHIN THE R.O.W. SUBJECT TO WORCESTER OPEN INSTRUCTION (APPROVAL) BEFORE STARTING ANY DISCREPANCY.
4. CORE GRADING MARKS (L-1, L-2) FOR CONTRACT UNIT LINE.
5. GRADED PARKING SPACES INDICATE THOSE SET ASIDE FOR THE PHYSICALLY HANDICAPPED. THESE SPACES ARE 21' WIDE, WITH A CURB CUT TO THE WALK, AND SIGNS INDICATING THEIR LOCATION. (SEE SYMBOL 54-118)
6. TEST PIT AND BORING LOCATIONS AS PER C.W. BUCKLEY, INC. - ARCHITECT.

FINAL DRAWINGS

**SITE LAYOUT  
LOWER SECTION**

SCALE  
1"=40'-0"  
DATE  
5-17-78

**SOUTHWEST HIGH SCHOOL  
WORCESTER, MASS.**



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members of the american society of landscape architects



**UCKLEY INC.**  
300 NORTH STREET  
WORCESTER, MASSACHUSETTS

**ARCHITECTS**

**L 2**



## SECTION 1A

### SUBSURFACE EXPLORATION

- A. Test boring or soil test information included in the drawings or specifications or otherwise made accessible to the Contractor, was obtained by the Owner for use by the Architect in the design of the building. The Owner does not hold out such information to the Contractor as an accurate or approximate indication of subsurface conditions, and no claim for extra cost or extension of time resulting from a reliance by the Contractor on such information shall be allowed, but if as a result of subsurface conditions discovered in the course of the work, changes in the work are authorized in writing as provided in Article 12 of the General Conditions, adjustments in the Contract Sum shall be made as provided in said Article 12.
- B. Test pits were taken on June 19 and 20, 1975 at the Apricot Street site. Test pits were excavated with a backhoe to the depths indicated on the test pit logs.

to C. W. Buckley Inc. Date 11/4/75 Job No. 75-230  
Location Proposed South-West High School, Apricot St., Scale 1" = 6 ft.  
Worcester, Mass.

Test Boring No. T-1  
Ground Surface - Elev. 775.1

|      |  |     |
|------|--|-----|
| 0"   | Loamy topsoil, some root matter.   |     |
| 1'0" | Very compact, damp to wet, fine to very fine sand with fine to med. gravel, few cobbles and boulders, some silt. | 2'  |
|      |  | 39  |
| WL   |  | 56  |
|      |  | 4'  |
|      |  | 37  |
|      |  | 74  |
|      |  | 5'  |
|      |  | 7'  |
|      |  | 10' |
| 13'  |  | 39  |
|      |  | 43  |
|      |  | 12' |

Refusal at 13'  
100/1" 300# hammer.  
(WL) Water Level 4'  
upon completion.

Test Boring No. T-1A moved 12' west  
Ground Surface - Elev. 775.3

|      |  |     |
|------|--|-----|
| 0"   | Topsoil.   |     |
| 1'   | Sandy subsoil.   |     |
| 2'   | Hard to compact, damp fine sand, some med. to coarse gravel, little silt.                              | 24  |
|      |  | 43  |
| 5'WL |  | 42  |
|      | Very compact, wet, fine sand, some fine to med. gravel, few cobbles and boulders, little to some silt. | 47  |
|      |  | 7'  |
|      |  | 10' |
|      |  | 35  |
|      |  | 68  |
|      |  | 12' |
|      |  | 15' |
|      |  | 91  |
|      |  | 122 |
| 18'  |  | 17' |

Refusal at 18' 100/0"  
300# hammer.  
(WL) Water Level 5'  
upon completion.

RECEIVED

NOV 7 1975

C. W. BUCKLEY, INC

FILE COPY

Figures in Right Hand Column  
Indicate the Number of Blows  
Necessary to Drive spoon 12  
inches using 140 lb. weight  
falling 30 inches.

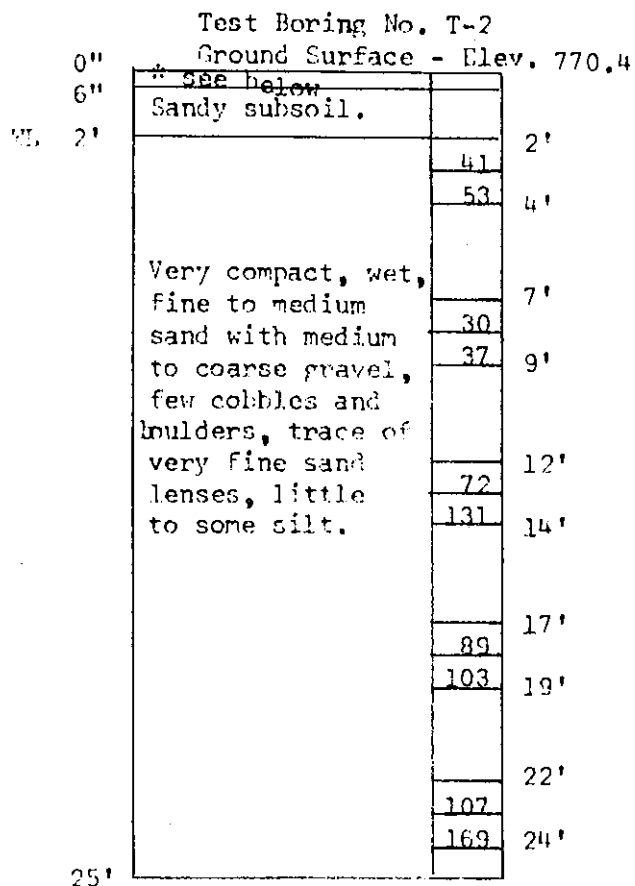
Casing Data

Casing O.D. 2-3/4" I.D. 2-1/2"  
Hammer Fall 24"  
Weight of Hammer 300#

Sampler Data

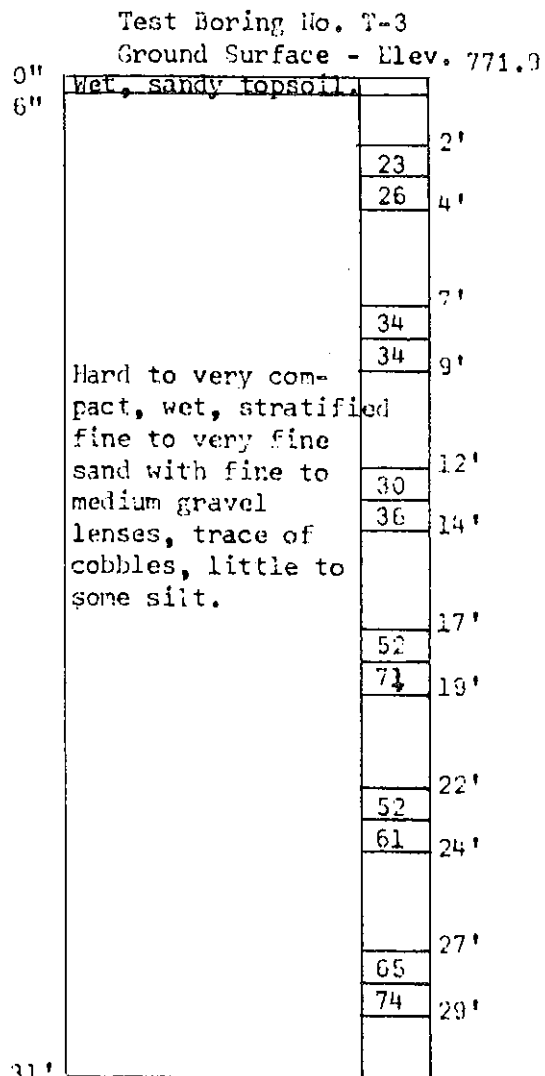
Sampler O.D. 2" I.D. 1-3/8"  
Inside Length of Sampler 24"  
Hammer Fall 30"  
Weight of Hammer 140#

To C. W. Buckley Inc. Date 11/4/75 Job No. 75-230  
Location Proposed South-West High School, Apricot Street, Worcester, Mass. Scale 1" = 6 ft.



Refusal at 25' 100/2"  
300# hammer.  
(WL) Water Level 2' upon completion.

\* Loamy topsoil, some root matter, decayed leaves.



Refusal at 31' 100/0"  
300# hammer.  
Water on ground surface.

RECEIVED

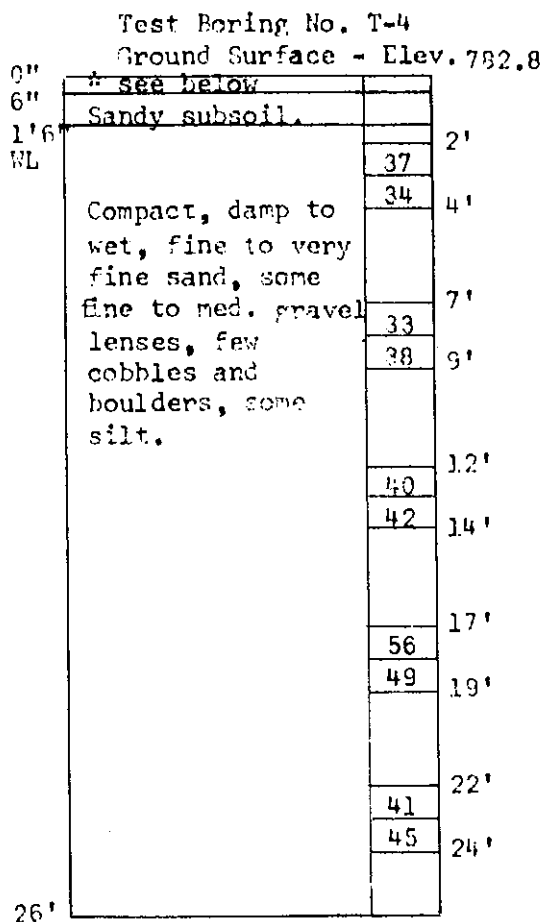
NOV 11 1975

C. W. BUCKLEY, INC.

FILE COPY

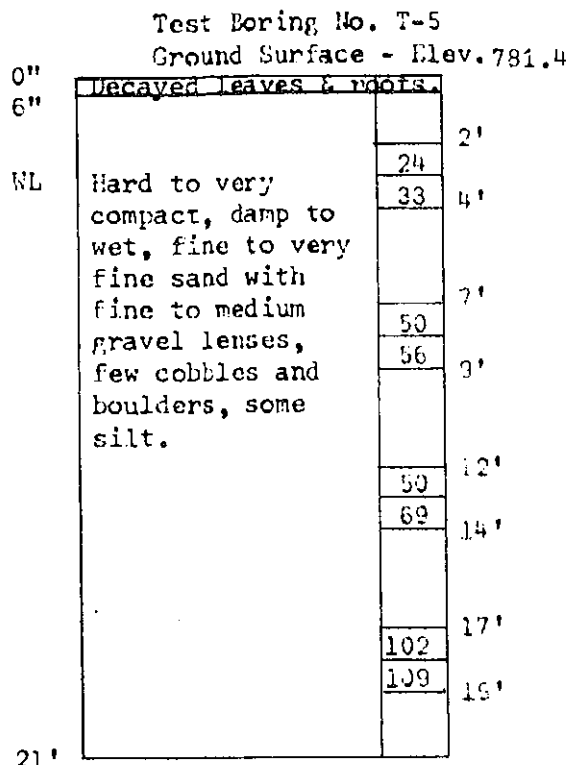
| Figures in Right Hand Column Indicate the Number of Blows Necessary to Drive spoon 12 inches using 140 lb. weight falling 30 inches. | Casing Data      |        | Sampler Data             |        |
|--|------------------|--------|--------------------------|--------|
|  | Casing O.D.      | I.D.   | Sampler O.D.             | I.D.   |
|  | 2-3/4"           | 2-1/2" | 2"                       | 1-3/8" |
|  | Hammer Fall      | 24"    | Inside Length of Sampler | 24"    |
|  | Weight of Hammer | 300#   | Hammer Fall              | 30"    |
|  |                  |        | Weight of Hammer         | 140#   |

o C. W. Buckley Inc. Date 11/5/75 Job No. 75-230  
ocation Proposed South-West High School, Spricot Street, Worcester, Mass. Scale 1" = 6 ft.



Refusal at 26' 100/2"  
300# hammer.  
(WL) Water Level 2'  
upon completion.

\* Decayed leaves and root matter.



Refusal at 21' 90/0"  
300# hammer.  
(WL) Water Level 3'  
upon completion.

RECEIVED

FILE COPY

Figures in Right Hand Column Indicate the Number of Blows Necessary to Drive spoon 12 inches using 140 lb. weight falling 30 inches.

Casing Data  
Casing O.D. 2-3/4" I.D. 2-1/2"  
Hammer Fall 24"  
Weight of Hammer 300#

Sampler Data  
Sampler O.D. 2" I.D. 1-3/8"  
Inside Length of Sampler 24"  
Hammer Fall 30"  
Weight of Hammer 140#



# TEST PIT REPORT

## B-1

0 Some loam, roots,  
surface water

6" Stones, fine sand, silt  
some clay, like hardpan

5' Sandier than above, damp

7' No refusal, no water

## B-2

0 Some loam, roots

6" Yellow subsoil

2' Stones, and small boulders,  
fine to very fine sand,  
some silt, gravelly and  
tightly packed

7' No refusal, no water

## B-3

0 Some loam, roots

6" Yellow subsoil

2' Material same as B-3

14' No refusal, no water  
but damp

## B-4

0 Some loam & roots

6" Yellow subsoil

3' Grey fine sand, some silt  
stones & flat boulders, damp

6' No refusal, no water

## B-5

0 Some loam & roots

6" Yellow subsoil

2' Grey fine sand and gravel,  
some silt, some stones  
tightly packed

14' No refusal, no water

## B-6

0 Some loam & roots

6" Yellow subsoil

2' Grey fine sand and gravel,  
some silt and stones

8' Water trickling in

11'-6" Water, refusal (apparently  
large boulders)

# TEST PIT REPORT

|            |  |             |  |
|------------|--|-------------|--|
| <u>B-7</u> |  | <u>B-10</u> |  |
| 0          | Some loam & roots<br>surface boulders  | 0           | Some loam, roots, large<br>surface boulders                                |
| 6"         |  | 6"          |  |
|            | Yellow subsoil                         |             | Material similar to B-5  |
| 2'         |  |             |  |
|            | Similar to B-1                         | 12'-6"      | No refusal, dry  |
| 11'        | No refusal, no water,<br>some boulders |             |  |
|            |  | <u>B-11</u> |  |
| <u>B-8</u> |  | 0           | Some loam & roots  |
| 0          | Roots & some loam                      | 6"          |  |
| 6"         |  |             | Material similar to B-5  |
|            | Yellow subsoil                         | 6'          | No refusal, dry  |
| 2'         |  |             |  |
|            | Material similar to B-5                | <u>B-12</u> |  |
| 4'         | Water seeping in                       | 0           | Roots, stones, wet, very<br>little soil                                    |
| 8'         | No refusal, wet                        | 1'          |  |
|            |  |             | Stone, some sand & silt,<br>wet  |
| <u>B-9</u> |  | 3'          | water surface  |
| 0          | Roots & some loam                      |             |  |
| 6"         |  | 5'          | Stones & gravel, fines<br>washed away. Bottom appears<br>firm when probed. |
|            | Yellow subsoil                         |             |  |
| 2'         |  |             |  |
|            | Material similar to B-5                |             |  |
| 10'        | Water trickling in                     |             |  |
| 12'        | No refusal, wet                        |             |  |

# TEST PIT REPORT

## B-13

0     Roots, some loam, surface  
       boulders

6"

       Sand & gravel, few fines, dry,  
       some stones

8'

       Fine sand & gravel, some silt  
       damp.

10'   No refusal, no water

## **APPENDIX B - Logs of LGCI's Borings**

|  |   |
|--|---|
| Project: <b>Proposed Worcester South High School, MA</b> |   |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>   | LGCI Project No.: 1644                      |
| Drilling Subcontractor: Northern Drill Serives           | Date Started: 8/11/2017                     |
| Drilling Foreman: Tim Tucker                             | Date Completed: 8/11/2017                   |
| LGCI Engineer: Hadi Kazemiroodsari                       | Location: Eastern side of lower parking lot |
| Ground Surface El: 746' (See remark 1)                   | Total Depth: 17'                            |
| Groundwater Depth: 3.5' upon completion of boring        | Drill Rig Type: Mobile Drill B-48 ATV       |
|  | Drilling Method: Drive and wash casing 4"   |
| Hammer Weight: 140 lbs                                   | Split Spoon Diameter: ID - 1.375", OD - 2"  |
| Hammer Type: Automatic                                   | Rock Core Barrel Size: NA                   |
| Drop: 30 inches  |   |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |      |       |       | Pen (in) | Rec (in) | Remarks | Strata                      | Sample Description   |
|-------------|-------------------|-----------|--------------------|------|-------|-------|----------|----------|---------|-----------------------------|--|
|             |                   |           | 0-6                | 6-12 | 12-18 | 18-24 |          |          |         |                             |  |
| 5ft         | 0.5-2             | S1        |                    | 6    | 18    | 13    | 18       | 8        |         | Asphalt                     | 0 - 6": Asphalt  |
|             |                   |           |                    |      |       |       |          |          |         |                             | S1 - Top 3": Well graded SAND with Gravel (SW), fine to coarse, ~15% fine gravel, dark brown, moist  |
|             | 2-4               | S2        | 15                 | 12   | 11    | 8     | 24       | 7        |         |                             | Bottom 5": Silty SAND with Gravel (SM), fine to medium, trace coarse, ~20% fines, ~20% fine gravel, light brown, wet   |
|             |                   |           |                    |      |       |       |          |          |         |                             | S2 - Silty SAND with Gravel (SM), fine to medium, 20-25% fines, 10-15% fine gravel, light brown, wet   |
|             | 4-6               | S3        | 9                  | 17   | 14    | 12    | 24       | 12       |         | Fill                        | S3 - Silty SAND with Gravel (SM), fine, ~20% fines, 10-15% fine gravel, trace of roots, olive green, wet   |
|             |                   |           |                    |      |       |       |          |          |         |                             | S4 - Silty SAND with Gravel (SM), fine to medium, ~20% fines, ~25% fine gravel, olive green, wet   |
| 10ft        | 6-8               | S4        | 18                 | 11   | 31    | 24    | 24       | 6        |         |                             |  |
|             |                   |           |                    |      |       |       |          |          |         |                             |  |
|             |                   |           |                    |      |       |       |          |          |         |                             |  |
|             |                   |           |                    |      |       |       |          |          |         |                             |  |
|             | 10-12             | S5        | 22                 | 7    | 13    | 25    | 24       | 5        |         | ~10'                        | S5 - Silty SAND with Gravel (SM), slightly plastic, fine to medium, ~25% fines, ~30% fine to coarse gravel, thin layer of peaty organic fines, gray to dark brown, wet |
|             |                   |           |                    |      |       |       |          |          |         | Buried Organics ~12'        |  |
| 15ft        |                   |           |                    |      |       |       |          |          |         |                             |  |
|             |                   |           |                    |      |       |       |          |          |         |                             |  |
|             |                   |           |                    |      |       |       |          |          |         |                             |  |
|             |                   |           |                    |      |       |       |          |          |         |                             |  |
|             | 15-17             | S6        | 19                 | 29   | 50    | 22    | 24       | 10       |         | Silty Sand with Gravel ~17' | S6 - Silty SAND with Gravel (SM), fine, ~25% fines, 15-20% fine gravel, gray, wet  |
|             |                   |           |                    |      |       |       |          |          |         |                             |  |
| 20ft        |                   |           |                    |      |       |       |          |          |         |                             |  |
|             |                   |           |                    |      |       |       |          |          |         |                             |  |
|             |                   |           |                    |      |       |       |          |          |         |                             |  |
|             |                   |           |                    |      |       |       |          |          |         |                             |  |
|             |                   |           |                    |      |       |       |          |          |         |                             |  |
|             |                   |           |                    |      |       |       |          |          |         |                             |  |

**Remarks:**

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.
- Open hole drive and wash techniques starting at 9'.

|  |                                |                        |                              |
|--|--------------------------------|------------------------|------------------------------|
| Project: <b>Proposed Worcester South High School, MA</b> |                                |                        |                              |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>   |                                | LGCI Project No.: 1644 |                              |
| Drilling Subcontractor:                                  | Northern Drill Serives         | Date Started:          | 8/10/2017                    |
| Drilling Foreman:  | Tim Tucker                     | Date Completed:        | 8/10/2017                    |
| LGCI Engineer:   | Hadi Kazemiroodsari            | Location:              | Southwestern corner of track |
| Ground Surface El:                                       | 766' (See remark 1)            | Total Depth:           | 21'                          |
| Groundwater Depth:                                       | 4.5' upon completion of boring | Drill Rig Type:        | Mobile Drill B-48 ATV        |
|  |                                | Drilling Method:       | Drive and wash casing 4"     |
| Hammer Weight:   | 140 lbs                        | Split Spoon Diameter:  | ID - 1.375", OD - 2"         |
| Hammer Type:   | Automatic                      | Rock Core Barrel Size: | NA                           |
| Drop:  | 30 inches                      |                        |                              |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |      |       |       | Pen (in) | Rec (in) | Remarks | Strata                  | Sample Description  |
|-------------|-------------------|-----------|--------------------|------|-------|-------|----------|----------|---------|-------------------------|---|
|             |                   |           | 0-6                | 6-12 | 12-18 | 18-24 |          |          |         |                         |   |
| 5ft         | 0-2               | S1        | 1                  | 3    | 7     | 7     | 24       | 14       | 2       | Topsoil/ Subsoil<br>~2' | S1 - Top 8": Silty SAND (SM), fine, ~35% fines, trace gravel, trace of organics, roots, grass, dark brown, moist<br>Bottom 6": Well graded SAND with Silt and Gravel (SW-SM), fine to medium, 5-10% fines, ~10% fine gravel, brown, moist |
|             | 2-4               | S2        | 9                  | 16   | 15    | 15    | 24       | 18       |         |                         | S2 - Silty SAND with Gravel (SM), fine, 20-25% fines, ~10% fine gravel, light brown, moist  |
|             | 4-6               | S3        | 16                 | 47   | 43    | 46    | 24       | 17       |         |                         | S3 - Silty SAND (SM), fine, ~15% fines, trace fine gravel, light brown, wet   |
|             | 6-8               | S4        | 51                 | 53   | 54    | 58    | 24       | 14       |         |                         | S4 - Similar to S3  |
| 10ft        | 9-11              | S5        | 27                 | 42   | 55    | 72    | 24       | 17       |         | Silty Sand with Gravel  | S5 - Silty SAND with Gravel (SM), fine, 15-20% fines, 15-20% fine gravel, light brown, wet  |
|             |                   |           |                    |      |       |       |          |          |         |                         |   |
|             |                   |           |                    |      |       |       |          |          |         |                         |   |
|             |                   |           |                    |      |       |       |          |          |         |                         |   |
| 15ft        | 14-16             | S6        | 23                 | 66   | 64    | 100/5 | 23       | 18       |         |                         | S6 - Silty SAND with Gravel (SM), fines, 15-20% fines, ~20% fine gravel, light brown, wet   |
|             |                   |           |                    |      |       |       |          |          |         |                         |   |
|             |                   |           |                    |      |       |       |          |          |         |                         |   |
|             |                   |           |                    |      |       |       |          |          |         |                         |   |
| 20ft        | 19-21             | S7        | 29                 | 66   | 60    | 96    | 24       | 20       |         | ~21'                    | S7 - Silty SAND with Gravel (SM), fine, ~15% fines, ~10% fine gravel, gray, wet   |
|             |                   |           |                    |      |       |       |          |          |         |                         |   |
|             |                   |           |                    |      |       |       |          |          |         |                         |   |
|             |                   |           |                    |      |       |       |          |          |         |                         |   |
|             |                   |           |                    |      |       |       |          |          |         |                         | Bottom of boring at 21'. Backfilled with drill cuttings.  |

**Remarks:**

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.
- Open hole drive and wash techniques starting at 4'.



## BORING LOG

### Boring B-3

Page 1 of 1

|                         |                              |   |                              |
|-------------------------|------------------------------|---|------------------------------|
| Project:                |                              | <b>Proposed Worcester South High School, MA</b> |                              |
| Client:                 |                              | <b>Lamoureux Pagano &amp; Associates, Inc.</b>  | LGCI Project No.: 1644       |
| Drilling Subcontractor: | Northern Drill Serives       | Date Started:                                   | 8/11/2017                    |
| Drilling Foreman:       | Tim Tucker                   | Date Completed:                                 | 8/11/2017                    |
| LGCI Engineer:          | Hadi Kazemiroodsari          | Location:                                       | Southwestern corner of track |
| Ground Surface El:      | 766' (See remark 1)          | Total Depth:                                    | 21'                          |
| Groundwater Depth:      | 1' upon completion of boring | Drill Rig Type:                                 | Mobile Drill B-48 ATV        |
|                         |                              | Drilling Method:                                | Drive and wash casing 4"     |
| Hammer Weight:          | 140 lbs                      | Split Spoon Diameter:                           | ID - 1.375", OD - 2"         |
| Hammer Type:            | Automatic                    | Rock Core Barrel Size:                          | NA                           |
| Drop:                   | 30 inches                    |   |                              |

[illegible]

## Remarks:

1. Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.
2. Open hole drive and wash techniques starting at 4'.
3. Encountered boulder while sampling. Split spoon sampler bent.

|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, MA</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>   | LGCI Project No.: 1644                     |
| Drilling Subcontractor: Northern Drill Serives           | Date Started: 8/10/2017                    |
| Drilling Foreman: Tim Tucker                             | Date Completed: 8/10/2017                  |
| LGCI Engineer: Hadi Kazemiroodsari                       | Location: Eastern side of track            |
| Ground Surface El: 766' (See remark 1)                   | Total Depth: 21'                           |
| Groundwater Depth: 5' upon completion of boring          | Drill Rig Type: Mobile Drill B-48 ATV      |
|  | Drilling Method: Drive and wash casing 4"  |
| Hammer Weight: 140 lbs                                   | Split Spoon Diameter: ID - 1.375", OD - 2" |
| Hammer Type: Automatic                                   | Rock Core Barrel Size: NA                  |
| Drop: 30 inches  |  |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |    |    |    | Pen (in) | Rec (in) | Remarks | Strata                 | Sample Description   |
|-------------|-------------------|-----------|--------------------|----|----|----|----------|----------|---------|------------------------|--|
| 5ft         | 0-2               | S1        | 2                  | 7  | 10 | 9  | 24       | 15       |         | Topsoil                | S1 - Top 6": Silty SAND (SM), fine, ~35% fines, trace fine gravel, organics, roots, grass, dark brown, moist             |
|             |                   |           |                    |    |    |    |          |          |         | Subsoil                | Bottom 9": Silty SAND (SM), ~15% fines, trace fine gravel, light brown, moist  |
|             | 2-4               | S2        | 9                  | 11 | 9  | 7  | 24       | 13       |         | ~2'                    |  |
|             |                   |           |                    |    |    |    |          |          |         | Fill                   | S2 - Silty SAND (SM), 10-15% fines, trace fine gravel, light brown, moist  |
|             | 4-6               | S3        | 47                 | 20 | 16 | 14 | 24       | 7        |         | ~4'                    |  |
|             |                   |           |                    |    |    |    |          |          |         |                        | S3 - Poorly graded SAND with Silt and Gravel (SP-SM), fine to medium, ~15% fines, 10-15% fine gravel, light brown, moist |
| 10ft        | 6-8               | S4        | 18                 | 16 | 13 | 9  | 24       | 11       |         | Silty Sand with Gravel | S4 - Similar to S3   |
|             |                   |           |                    |    |    |    |          |          |         |                        |  |
|             |                   |           |                    |    |    |    |          |          |         |                        |  |
|             | 9-11              | S5        | 10                 | 12 | 15 | 16 | 24       | 8        |         |                        | S5 - Silty SAND with Gravel (SM), fine, ~10% fines, 10-15% fine gravel, light brown, wet                                 |
|             |                   |           |                    |    |    |    |          |          |         |                        |  |
|             |                   |           |                    |    |    |    |          |          |         |                        |  |
| 15ft        |                   |           |                    |    |    |    |          |          |         |                        |  |
|             |                   |           |                    |    |    |    |          |          |         |                        |  |
|             | 14-16             | S6        | 49                 | 23 | 17 | 15 | 24       | 12       |         |                        | S6 - Well graded SAND with Silt and Gravel (SW), fine, ~10% fines, ~10% fine gravel, light brown, wet                    |
|             |                   |           |                    |    |    |    |          |          |         |                        |  |
|             |                   |           |                    |    |    |    |          |          |         |                        |  |
|             |                   |           |                    |    |    |    |          |          |         |                        |  |
| 20ft        |                   |           |                    |    |    |    |          |          |         |                        |  |
|             | 19-21             | S7        | 13                 | 16 | 20 | 27 | 24       | 14       |         |                        | S7 - Well graded SAND with Silt and Gravel (SM), fine, 10-15% fines, ~10% fine gravel, light brown, wet                  |
|             |                   |           |                    |    |    |    |          |          |         |                        |  |
|             |                   |           |                    |    |    |    |          |          |         |                        |  |
|             |                   |           |                    |    |    |    |          |          |         |                        |  |
|             |                   |           |                    |    |    |    |          |          |         |                        |  |
|             |                   |           |                    |    |    |    |          |          |         | ~21'                   | Bottom of boring at 21'. Backfilled with drill cuttings.   |

**Remarks:**

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.
- Open hole drive and wash techniques starting at 14'.



|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, MA</b>                       |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                     |
| Drilling Subcontractor: Northern Drill Serives                                 | Date Started: 8/10/2017                    |
| Drilling Foreman: Tim Tucker   | Date Completed: 8/11/2017                  |
| LGCI Engineer: Hadi Kazemiroodsari   | Location: Western side of track            |
| Ground Surface El: 766' (See remark 1)   | Total Depth: 21'                           |
| Groundwater Depth: 2.5' at end of drilling, 11.5' 15 hrs after end of drilling | Drill Rig Type: Mobile Drill B-48 ATV      |
|  | Drilling Method: Drive and wash casing 4"  |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2" |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                  |
| Drop: 30 inches  |  |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |      |       |       | Pen (in) | Rec (in) | Remarks | Strata          | Sample Description   |
|-------------|-------------------|-----------|--------------------|------|-------|-------|----------|----------|---------|-----------------|--|
|             |                   |           | 0-6                | 6-12 | 12-18 | 18-24 |          |          |         |                 |  |
| 5ft         | 0-2               | S1        | 2                  | 7    | 12    | 15    | 24       | 13       |         | Topsoil         | S1- Top 5": Silty SAND (SM), fine, ~35% fines, trace of organics, roots, grass, dark brown, moist              |
|             | 2-4               | S2        | 6                  | 11   | 12    | 8     | 24       | 7        |         | Fill            | Bottom 8": Poorly graded SAND with Gravel (SP), fine to medium, ~15% fine gravel, light brown, moist           |
|             | 4-6               | S3        | 4                  | 4    | 15    | 21    | 24       | 11       |         | ~4'             | S2- Silty GRAVEL with Sand (GM), fine, ~20-25% fines, ~30% fine to coarse sand, light brown, moist             |
| 10ft        | 6-8               | S4        | 15                 | 11   | 26    | 25    | 24       | 8        |         | Buried Organics | S3- Top 5": Silty SAND (SM), fine, ~30% organic fines, fibrous peat, roots, dark brown to brown, wet           |
|             | 9-11              | S5        | 14                 | 26   | 32    | 36    | 24       | 13       |         | ~8'             | Bottom 6": Silty SAND with Gravel (SM), fine to medium, ~20% fines, trace of organics, roots, brown, wet       |
|             | 14-16             | S6        | 18                 | 15   | 14    | 18    | 24       | 12       |         |                 | S4- Top 0.5": Similar to bottom 6" of S3   |
| 15ft        | 19-21             | S7        | 20                 | 22   | 38    | 42    | 24       | 14       |         |                 | Bottom 7.5": Silty SAND with Gravel (SM), fine, ~25% fines, ~5% fine gravel, trace organics, roots, brown, wet |
|             |                   |           |                    |      |       |       |          |          |         |                 | S5- Silty SAND with Gravel (SM), fine, ~15-20% fines, ~10% fine gravel, light brown, wet                       |
|             |                   |           |                    |      |       |       |          |          |         |                 | S6- Similar to S5  |
| 20ft        |                   |           |                    |      |       |       |          |          |         |                 | S7- Similar to S5  |
|             |                   |           |                    |      |       |       |          |          |         | ~21'            |  |
|             |                   |           |                    |      |       |       |          |          |         |                 | Bottom of boring at 21'. Backfilled with drill cuttings.   |

**Remarks:**

1. Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.

|  |                                |                        |                              |
|--|--------------------------------|------------------------|------------------------------|
| Project: <b>Proposed Worcester South High School, MA</b> |                                |                        |                              |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>   |                                | LGCI Project No.: 1644 |                              |
| Drilling Subcontractor:                                  | Northern Drill Serives         | Date Started:          | 8/10/2017                    |
| Drilling Foreman:  | Tim Tucker                     | Date Completed:        | 8/10/2017                    |
| LGCI Engineer:   | Hadi Kazemiroodsari            | Location:              | Northeastern corner of track |
| Ground Surface El:                                       | 765.5' (See remark 1)          | Total Depth:           | 21'                          |
| Groundwater Depth:                                       | 2.5' upon completion of boring | Drill Rig Type:        | Mobile Drill B-48 ATV        |
|  |                                | Drilling Method:       | Drive and wash casing 4"     |
| Hammer Weight:   | 140 lbs                        | Split Spoon Diameter:  | ID - 1.375", OD - 2"         |
| Hammer Type:   | Automatic                      | Rock Core Barrel Size: | NA                           |
| Drop:  | 30 inches                      |                        |                              |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |      |       |       | Pen (in) | Rec (in) | Remarks | Strata                 | Sample Description   |
|-------------|-------------------|-----------|--------------------|------|-------|-------|----------|----------|---------|------------------------|--|
|             |                   |           | 0-6                | 6-12 | 12-18 | 18-24 |          |          |         |                        |  |
| 5ft         | 0-2               | S1        | 2                  | 6    | 7     | 8     | 24       | 17       | 2       | Topsoil                | S1- Top 7": Silty SAND with Gravel (SM), fine, ~35% fines, ~15% fine gravel, trace of organics, roots, grass, dark brown, moist<br>Bottom 10": Silty SAND (SM), fine, 10-15% fines, trace gravel, light brown, moist<br>S2- Silty SAND with Gravel (SM), fine, 10-15% fines, ~20% fine gravel, light brown, moist<br>S3- Silty SAND with Gravel (SM), fine to medium, ~15% fines, ~15% fine gravel, trace of organics, roots, light brown, moist |
|             |                   |           |                    |      |       |       |          |          |         | Subsoil                |  |
|             | 2-4               | S2        | 9                  | 11   | 22    | 50/5  | 23       | 16       |         | ~2'                    |  |
|             | 4-6               | S3        | 103/5              |      |       |       | 5        | 3        |         | Fill                   |  |
| 10ft        | 6-8               | S4        | 10                 | 18   | 25    | 30    | 24       | 11       | 3       | ~6'                    | S4- Well graded SAND with Silt and Gravel (SW-SM), fine to medium, 5-10% fines, 15-20% fine gravel, light brown, moist<br>S5- Silty SAND with Gravel (SM), fine to medium, ~20% fines, ~20% fine gravel, light brown, moist  |
|             |                   |           |                    |      |       |       |          |          |         |                        |  |
|             | 9-11              | S5        | 19                 | 22   | 19    | 28    | 24       | 14       |         |                        |  |
|             |                   |           |                    |      |       |       |          |          |         |                        |  |
| 15ft        | 14-16             | S6        | 14                 | 43   | 55/2  |       | 14       | 10       | 4       | Silty Sand with Gravel | S6- Similar to S5  |
|             |                   |           |                    |      |       |       |          |          |         |                        |  |
|             |                   |           |                    |      |       |       |          |          |         |                        |  |
|             |                   |           |                    |      |       |       |          |          |         |                        |  |
| 20ft        | 19-21             | S7        | 13                 | 37   | 44    | 82    | 24       | 12       |         | ~21'                   | S7- Similar to S5  |
|             |                   |           |                    |      |       |       |          |          |         |                        |  |
|             |                   |           |                    |      |       |       |          |          |         |                        |  |
|             |                   |           |                    |      |       |       |          |          |         |                        |  |
|             |                   |           |                    |      |       |       |          |          |         |                        | Bottom of boring at 21'. Backfilled with drill cuttings.   |

**Remarks:**

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.
- Encountered boulder while sampling. Open hole drive and wash techniques starting at 4'.
- Split spoon sampler bent. Drilled through ~1.5' boulder.
- Encountered boulder at 12'.

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| Project: <b>Proposed Worcester South High School, MA</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>   | LGCI Project No.: 1644                           |
| Drilling Subcontractor: Northern Drill Serives           | Date Started: 8/11/2017                          |
| Drilling Foreman: Tim Tucker                             | Date Completed: 8/11/2017                        |
| LGCI Engineer: Hadi Kazemiroodsari                       | Location: Athletic field NW of existing building |
| Ground Surface El: 769.5' (See remark 1)                 | Total Depth: 16'                                 |
| Groundwater Depth: 3' upon completion of boring          | Drill Rig Type: Mobile Drill B-48 ATV            |
|  | Drilling Method: Drive and wash casing 4"        |
| Hammer Weight: 140 lbs                                   | Split Spoon Diameter: ID - 1.375", OD - 2"       |
| Hammer Type: Automatic                                   | Rock Core Barrel Size: NA                        |
| Drop: 30 inches  |  |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |    |    |    | Pen (in) | Rec (in) | Remarks | Strata                 | Sample Description  |
|-------------|-------------------|-----------|--------------------|----|----|----|----------|----------|---------|------------------------|---|
| 5ft         | 0-2               | S1        | 3                  | 11 | 8  | 23 | 24       | 13       |         | Topsoil                | S1- Top 5": Silty SAND (SM), fine, ~35% fines, trace of organics, roots, grass, dark brown, moist                             |
|             |                   |           |                    |    |    |    |          |          |         | Subsoil                | Bottom 8": Poorly graded SAND with Silt & Gravel (SP-SM), fine to medium, ~10% fines, ~20% fine gravel, light brown, moist    |
|             | 2-4               | S2        | 22                 | 22 | 19 | 15 | 24       | 20       |         | ~2'                    | S2- Silty GRAVEL with Sand (GM), fine, ~40% fines, ~30% fine to coarse sand, brown, moist                                     |
|             | 4-6               | S3        | 7                  | 9  | 19 | 31 | 24       | 15       |         | Fill                   | S3- Top 6": Silty SAND (SM), fine, ~20% fines, ~40% organic fines, dark gray, wet   |
|             | 6-8               | S4        | 31                 | 43 | 51 | 48 | 24       | 14       |         | ~6'                    | Bottom 9": Silty SAND with Gravel (SM), fine to medium, ~15% fines, ~20% fine gravel, thin layers up to 1/8" peat, brown, wet |
| 10ft        | 9-11              | S5        | 13                 | 19 | 16 | 16 | 24       | 8        |         | Silty Sand with Gravel | S4- Well graded SAND with Silt and Gravel (SW-SM), fine to medium, ~10% fines, ~20% fine gravel, brown, wet                   |
|             |                   |           |                    |    |    |    |          |          |         |                        | S5- Silty SAND with Gravel (SM), fine to coarse, ~15% fines, ~15% fine gravel, light brown, wet                               |
|             |                   |           |                    |    |    |    |          |          |         |                        |   |
|             |                   |           |                    |    |    |    |          |          |         |                        |   |
|             |                   |           |                    |    |    |    |          |          |         |                        |   |
| 15ft        | 14-16             | S6        | 13                 | 13 | 15 | 13 | 24       | 8        |         | ~16'                   | S6- Similar to S5, ~20% fines   |
|             |                   |           |                    |    |    |    |          |          |         |                        |   |
|             |                   |           |                    |    |    |    |          |          |         |                        |   |
|             |                   |           |                    |    |    |    |          |          |         |                        |   |
|             |                   |           |                    |    |    |    |          |          |         |                        |   |
| 20ft        |                   |           |                    |    |    |    |          |          |         |                        | Bottom of boring at 16'. Backfilled with drill cuttings.  |
|             |                   |           |                    |    |    |    |          |          |         |                        |   |
|             |                   |           |                    |    |    |    |          |          |         |                        |   |
|             |                   |           |                    |    |    |    |          |          |         |                        |   |
|             |                   |           |                    |    |    |    |          |          |         |                        |   |

**Remarks:**

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.
- Open hole drive and wash techniques starting at 4'.

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| Project: <b>Proposed Worcester South High School, MA</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>   | LGCI Project No.: 1644                     |
| Drilling Subcontractor: Northern Drill Serives           | Date Started: 8/11/2017                    |
| Drilling Foreman: Tim Tucker                             | Date Completed: 8/11/2017                  |
| LGCI Engineer: Hadi Kazemiroodsari                       | Location: South of existing building       |
| Ground Surface El: 783.5' (See remark 1)                 | Total Depth: 21'                           |
| Groundwater Depth: 4' upon completion of boring          | Drill Rig Type: Mobile Drill B-48 ATV      |
|  | Drilling Method: Drive and wash casing 4"  |
| Hammer Weight: 140 lbs                                   | Split Spoon Diameter: ID - 1.375", OD - 2" |
| Hammer Type: Automatic                                   | Rock Core Barrel Size: NA                  |
| Drop: 30 inches  |  |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |      |       |       | Pen (in) | Rec (in) | Remarks | Strata                 | Sample Description  |
|-------------|-------------------|-----------|--------------------|------|-------|-------|----------|----------|---------|------------------------|---|
|             |                   |           | 0-6                | 6-12 | 12-18 | 18-24 |          |          |         |                        |   |
| 5ft         | 0.5-2             | S1        |                    | 10   | 12    | 21    | 18       | 6        |         | Asphalt                | 0 - 6": Asphalt   |
|             |                   |           |                    |      |       |       |          |          |         | Fill                   | S1- Poorly graded SAND with Gravel (SP), medium to coarse, ~25% fine gravel, dark brown to gray, moist<br>S2- Silty SAND (SM), fine to medium, trace coarse, 40-45% fines, 10-15% fine gravel, light brown, moist |
|             | 2-4               | S2        | 41                 | 14   | 11    | 10    | 24       | 11       |         | ~4'                    |   |
| 10ft        | 4-6               | S3        | 4                  | 9    | 31    | 28    | 24       | 9        |         | Silty Sand with Gravel | S3- Silty SAND with Gravel (SM), fine, 30-35% fines, ~30% fine gravel, gray, wet  |
|             |                   |           |                    |      |       |       |          |          |         |                        | S4- Silty SAND with Gravel (SM), fine, 30-35% fines, ~30% fine gravel, light brown, wet   |
|             | 6-8               | S4        | 20                 | 11   | 11    | 14    | 24       | 11       |         |                        |   |
| 15ft        | 9-11              | S5        | 12                 | 30   | 26    | 16    | 24       | 8        | 2       |                        | S5- Silty SAND with Gravel (SM), fine to medium, ~15% fines, ~20% fine gravel, light brown, wet   |
|             |                   |           |                    |      |       |       |          |          |         |                        |   |
|             |                   |           |                    |      |       |       |          |          |         |                        |   |
| 20ft        | 14-16             | S6        | 19                 | 23   | 19    | 37    | 24       | 13       | 3       |                        | S6- Well graded SAND with Silt and Gravel (SW-SM), fine to medium, trace coarse, ~10% fines 15-20% fine gravel, light brown, wet  |
|             |                   |           |                    |      |       |       |          |          |         |                        |   |
|             |                   |           |                    |      |       |       |          |          |         |                        |   |
|             | 19-21             | S7        | 16                 | 13   | 8     | 11    | 24       | 7        |         |                        | S7- Similar to S6   |
|             |                   |           |                    |      |       |       |          |          |         | ~21'                   |   |
|             |                   |           |                    |      |       |       |          |          |         |                        | Bottom of boring at 21'. Backfilled with drill cuttings. Ground surface restored with cold asphalt patch.   |

**Remarks:**

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.
- Open hole drive and wash techniques starting at 9'.
- Encountered boulder at 12'.

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| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/13/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/13/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: Western edge of northern athletic field  |
| Ground Surface El: 764.9 feet (see remark 1)                                   | Total Depth: 16 feet                               |
| Groundwater Depth: ~1.7 ft. at end of drilling                                 | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4-inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |      |       |       | Pen (in) | Rec (in) | Remarks | Strata  | Sample Description   |
|-------------|-------------------|-----------|--------------------|------|-------|-------|----------|----------|---------|---------|--|
|             |                   |           | 0-6                | 6-12 | 12-18 | 18-24 |          |          |         |         |  |
| 5ft         | 0-2               | S1        | 2                  | 4    | 7     | 6     | 24       | 10       | 2       | Topsoil | S1 - Top 5": Silty SAND (SM), fine, ~25% fines, trace fine gravel, trace organic fines, trace roots, dark brown, moist |
|             |                   |           |                    |      |       |       |          |          |         | Subsoil | Bot. 5": Silty SAND with Gravel (SM), fine, ~20% fines, ~15% fine gravel, trace roots, brown, moist                    |
|             | 2-4               | S2        | 3                  | 5    | 5     | 3     | 24       | 9        |         |         | S2 - Silty SAND (SM), fine, 10-15% fines, trace fine gravel, brown, moist  |
|             | 4-6               | S3        | 6                  | 3    | 3     | 5     | 24       | 0        |         |         | S3 - No recovery   |
| 10ft        |                   |           |                    |      |       |       |          |          | 2       | ~6 ft.  | S4 - Poorly Graded SAND with Silt (SP-SM), fine, 5-10% fines, light brown, moist                                       |
|             | 6-8               | S4        | 14                 | 12   | 17    | 20    | 24       | 9        |         | Sand    |  |
|             |                   |           |                    |      |       |       |          |          |         |         | S5 - Silty SAND (SM), fine, trace medium, 15-20% fines, 5-10% fine gravel, light brown, wet                            |
|             | 8-10              | S5        | 25                 | 35   | 38    | 47    | 24       | 12       |         |         |  |
| 15ft        |                   |           |                    |      |       |       |          |          | 2       | ~16 ft. | S6 - Silty SAND (SM), fine, ~25% fines, ~5% fine gravel, light brown, wet  |
|             | 14-16             | S6        | 17                 | 27   | 32    | 31    | 24       | 20       |         |         |  |
|             |                   |           |                    |      |       |       |          |          |         |         |  |
|             |                   |           |                    |      |       |       |          |          |         |         |  |
| 20ft        |                   |           |                    |      |       |       |          |          | 2       |         | Bottom of boring at 16 feet. Backfilled borehole with drill cuttings.  |
|             |                   |           |                    |      |       |       |          |          |         |         |  |
|             |                   |           |                    |      |       |       |          |          |         |         |  |
|             |                   |           |                    |      |       |       |          |          |         |         |  |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Open hole drive and wash techniques used at 8 feet.

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| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/13/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/13/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: SW corner of northern athletic field     |
| Ground Surface El: 767 feet (see remark 1)                                     | Total Depth: 10 feet                               |
| Groundwater Depth: ~2 ft. at end of drilling                                   | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4-inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |      |       |       | Pen (in) | Rec (in) | Remarks | Strata           | Sample Description   |
|-------------|-------------------|-----------|--------------------|------|-------|-------|----------|----------|---------|------------------|--|
|             |                   |           | 0-6                | 6-12 | 12-18 | 18-24 |          |          |         |                  |  |
| 5ft         | 0-2               | S1        | 11                 | 6    | 10    | 14    | 24       | 21       | 2       | Topsoil ~1.3 ft. | S1 - Top 15": Silty SAND (SM), fine, ~25% fines, trace organic fines, trace roots, dark brown, moist           |
|             |                   |           |                    |      |       |       |          |          |         | Subsoil          | Bot. 6": Silty SAND with Gravel (SM), fine, trace medium, ~15% fines, ~15% fine angular gravel, brown, wet     |
|             | 2-4               | S2        | 24                 | 21   | 21    | 23    | 24       | 19       |         | Sand             | S2 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine, ~10% fines, 15-20% fine gravel, light brown, moist |
|             | 4-6               | S3        | 17                 | 17   | 19    | 20    | 24       | 13       |         |                  | S3 - Similar to S2   |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
| 10ft        | 6-8               | S4        | 15                 | 16   | 27    | 32    | 24       | 14       |         |                  | S4 - Silty SAND (SM), fine, ~15% fines, trace fine gravel, light brown, moist                                  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             | 8-10              | S5        | 17                 | 27   | 30    | 31    | 24       | 15       |         |                  | S5 - Similar to S4   |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
| 15ft        |                   |           |                    |      |       |       |          |          | ~10 ft. |                  | Bottom of boring at 10 feet. Backfilled borehole with drill cuttings.  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
| 20ft        |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |
|             |                   |           |                    |      |       |       |          |          |         |                  |  |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Open hole drive and wash techniques used at 4 feet.

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| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b>         |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                                 | LGCI Project No.: 1644                     |
| Drilling Subcontractor: Northern Drill Service, Inc.                                   | Date Started: 2/13/2018                    |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/14/2018                  |
| LGCI Engineer: Tom Sinnott   | Location: Northern athletic field          |
| Ground Surface El: 767 feet (see remark 1)   | Total Depth: 17 feet                       |
| Groundwater Depth: ~14.2 ft. at end of drilling<br>~8.9 ft. 31 hrs. after installation | Drill Rig Type: Mobile B-48 Track Rig      |
|  | Drilling Method: HSA (3-1/4" ID)           |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2" |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                  |
| Drop: 30 inches  |  |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |      |       |       | Pen (in) | Rec (in) | Remarks | Strata         | Sample Description   |
|-------------|-------------------|-----------|--------------------|------|-------|-------|----------|----------|---------|----------------|--|
|             |                   |           | 0-6                | 6-12 | 12-18 | 18-24 |          |          |         |                |  |
| 5ft         | 0-2               | S1        | 8                  | 8    | 9     | 12    | 24       | 18       |         | Topsoil        | S1 - Top 10": Silty SAND (SM), fine, 20-25% fines, 5-10% fine gravel, trace organic fines, trace roots, dark brown, moist                              |
|             |                   |           |                    |      |       |       |          |          |         | Subsoil ~2 ft. | Bot. 8": Silty SAND (SM), fine, ~20% fines, trace roots, brown, moist  |
|             | 2-4               | S2        | 13                 | 14   | 20    | 58    | 24       | 16       |         | Sand           | S2 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine, trace medium, 5-10% fines, 20-25% fine gravel, angular stone fragments, light brown, moist |
|             | 4-6               | S3        | 43                 | 47   | 50    | 47    | 24       | 21       |         |                | S3 - Poorly Graded SAND with Silt (SP-SM), fine, 10-15% fines, trace fine angular gravel, light brown, moist   |
|             | 6-8               | S4        | 45                 | 63   | 60/4  |       | 16       | 16       |         |                | S4 - Silty SAND (SM), fine, 15-20% fines, trace fine angular gravel, light brown, moist  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
| 10ft        | 10-12             | S5        | 30                 | 29   | 34    | 60    | 24       | 18       |         |                | S5 - Silty SAND (SM), fine, 20-25% fines, ~5% fine gravel, light brown, wet  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
| 15ft        | 15-17             | S6        | 27                 | 66   | 55    | 62    | 24       | 19       |         |                | S6 - Similar to S5, ~20% fines   |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
| 20ft        |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |

**Remarks:**

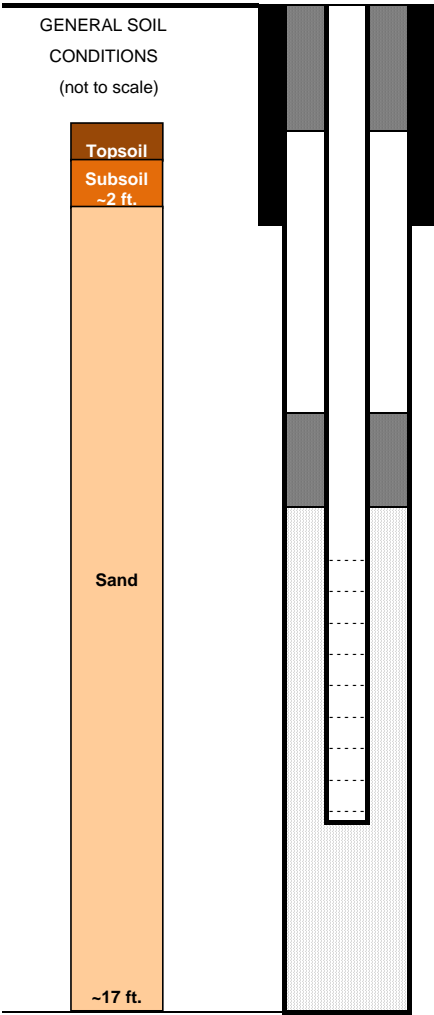
- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.

# GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

 Boring No. : **B-103-OW**

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|                           |  |                        |                         |
|---------------------------|--|------------------------|-------------------------|
| Project Name:             | <b>Proposed Worcester South High School, Worcester, Massachusetts</b>    |                        |                         |
| LGCI Project Number:      | <b>1644</b>  |                        |                         |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                           |                        |                         |
| Drilling Subcontractor:   | Northern Drill Service, Inc.   | Date Started:          | 2/14/2018               |
| Drilling Foreman:         | Tim Tucker   | Date Completed:        | 2/14/2018               |
| LGCI Engineer:            | Tom Sinnott  | Location:              | Northern athletic field |
| Ground Surface Elevation: | 767 feet (see remark 1)  | Total Depth of Boring: | 17 feet                 |
| Ground Water Depth:       | ~14.2 ft. at end of installation<br>~8.9 ft. 31 hours after installation | Drill Rig Type:        | Mobile B-48 Track Rig   |
|                           |  | Drilling Method:       | HSA (3-1/4" ID)         |

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|--|--|--|-------------------|
| <p>GENERAL SOIL CONDITIONS (not to scale)</p>  |  | Riser Stickup ~0' above ground surface |                   |
|  | THICKNESS OF SURFACE SEAL                |  | 4 inch            |
|  | TYPE OF SURFACE SEAL                     |  | Concrete          |
|  | TYPE OF SURFACE CASING                   |  | Aluminum road box |
|  | ID OF SURFACE CASING                     |  | 6 inch            |
|  | DEPTH TO BOTTOM OF CASING                |  | 1 foot            |
|  | ID OF RISER PIPE                         |  | 2 inch            |
|  | TYPE OF RISER PIPE                       |  | Schedule 40 PVC   |
|  | TYPE OF BACKFILL AROUND RISER PIPE       |  | Holliston sand    |
|  | DEPTH TO TOP OF SEAL                     |  | 1.5 feet          |
|  | TYPE OF SEAL                             |  | Bentonite chips   |
|  | DEPTH TO BOTTOM OF SEAL                  |  | 3.5 feet          |
|  | DEPTH TO TOP OF PERVIOUS SECTION         |  | 5 feet            |
|  | TYPE OF PERVIOUS SECTION                 |  | Schedule 40 PVC   |
|  | DESCRIBE OPENINGS                        |  | 0.01 inch slots   |
|  | ID OF PERVIOUS SECTION                   |  | 2 inch            |
|  | TYPE OF BACKFILL AROUND PERVIOUS SECTION |  | Holliston sand    |
|  | DEPTH TO BOTTOM OF PERVIOUS SECTION      |  | 15 feet           |
|  | DEPTH TO BOTTOM OF SAND COLUMN           |  | 17 feet           |
|  | TYPE OF BACKFILL BELOW PERVIOUS SECTION  |  | Holliston sand    |
|  | DIAMETER OF BOREHOLE                     |  | 9 inch            |
|  | DEPTH TO BOTTOM OF BOREHOLE              |  | 17 feet           |

Remarks: 1. Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.



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| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/13/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/13/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: Northern athletic field                  |
| Ground Surface El: 767.1 feet (see remark 1)                                   | Total Depth: 16 feet                               |
| Groundwater Depth: ~2.2 ft. at end of drilling                                 | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4-inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks     | Strata  | Sample Description   |   |
|-------|------------|--------|--------------------|------|-------|-------|------|------|-------------|---|--|---|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |             |   |  |   |
| 5ft   | 0-2        | S1     | 15                 | 12   | 24    | 13    | 24   | 15   | 2<br>3<br>4 | Topsoil   | S1 - Top 8": Silty SAND with Gravel (SM), fine, ~20% fines, ~25% fine gravel, trace organic fines, trace roots, angular stone fragments, dark brown, moist |   |
|       |            |        |                    |      |       |       |      |      |             | Subsoil ~2 ft.  | Bot. 7": Silty SAND (SM), fine, 20-25% fines, trace fine gravel, trace roots, brown, moist   |   |
|       | 2-4        | S2     | 19                 | 70/4 |       |       | 10   | 10   |             | S2 - Poorly Graded SAND with Silt (SP-SM), fine, 5-10% fines, 5-10% fine gravel, light brown, moist |  |   |
|       |            |        |                    |      |       |       |      |      |             | S3 - Silty SAND with Gravel (SM), fine, ~15% fines, ~15% fine gravel, light brown, moist            |  |   |
|       | 4-6        | S3     | 13                 | 12   | 14    | 12    | 24   | 18   |             | S4 - Similar to S3  |  |   |
| 10ft  |            |        |                    |      |       |       |      |      |             | Sand  | S5 - Silty SAND (SM), fine, ~25% fines, light brown, wet   |   |
|       | 6-8        | S4     | 14                 | 12   | 12    | 15    | 24   | 17   |             |   |  |   |
|       |            |        |                    |      |       |       |      |      |             |   |  |   |
|       | 8-10       | S5     | 11                 | 18   | 40    | 35    | 24   | 12   |             |   |  |   |
|       |            |        |                    |      |       |       |      |      |             |   |  |   |
| 15ft  |            |        |                    |      |       |       |      |      |             |   |  |   |
|       |            |        |                    |      |       |       |      |      |             |   |  |   |
|       |            |        |                    |      |       |       |      |      |             |   |  |   |
|       |            |        |                    |      |       |       |      |      |             |   |  |   |
|       | 14-16      | S6     | 31                 | 57   | 48    | 48    | 24   | 21   |             |   |  | S6 - Silty SAND (SM), fine, 30-35% fines, trace fine gravel, light brown, wet |
| 20ft  |            |        |                    |      |       |       |      |      |             |   | ~16 ft.  | Bottom of boring at 16 feet. Backfilled borehole with drill cuttings.         |
|       |            |        |                    |      |       |       |      |      |             |   |  |   |
|       |            |        |                    |      |       |       |      |      |             |   |  |   |
|       |            |        |                    |      |       |       |      |      |             |   |  |   |
|       |            |        |                    |      |       |       |      |      |             |   |  |   |
|       |            |        |                    |      |       |       |      |      |             |   |  |   |
|       |            |        |                    |      |       |       |      |      |             |   |  |   |
|       |            |        |                    |      |       |       |      |      |             |   |  |   |
|       |            |        |                    |      |       |       |      |      |             |   |  |   |
|       |            |        |                    |      |       |       |      |      |             |   |  |   |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Split spoon sampler bounced for 30 blows; drillers stopped sampling to avoid equipment damage.
- Drill chattered at 3 feet.
- Open hole drive and wash techniques used at 4 feet.

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| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/14/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/14/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: Southern edge of northern athletic field |
| Ground Surface El: 765.2 feet (see remark 1)                                   | Total Depth: 17 feet                               |
| Groundwater Depth: NE  | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: HSA (3-1/4" ID)                   |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata  | Sample Description  |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|---------|---|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |         |   |
| 5ft   | 0-2        | S1     | 4                  | 3    | 6     | 10    | 24   | 11   |         | Topsoil | S1 - Top 7": Silty SAND (SM), fine, 20-25% fines, trace fine gravel, trace organic fines, trace roots, dark brown, frozen |
|       |            |        |                    |      |       |       |      |      |         | Fill    | Bot. 4": Silty SAND (SM), fine, 20-25% fines, trace fine gravel, trace roots, brown, moist                                |
|       | 2-4        | S2     | 9                  | 12   | 20    | 38    | 24   | 4    |         |         | S2 - Silty SAND with Gravel (SM), fine, ~20% fines, 25-30% fine to angular gravel, brown, moist                           |
|       | 4-6        | S3     | 8                  | 11   | 11    | 10    | 24   | 18   |         |         | S3 - Silty SAND (SM), fine to medium, 45-50% fines, trace fine subangular gravel, brown, moist                            |
|       |            |        |                    |      |       |       |      |      |         | Sand    |   |
| 10ft  | 6-8        | S4     | 9                  | 15   | 21    | 25    | 24   | 24   |         |         | S4 - Silty SAND (SM), fine, ~25% fines, trace fine gravel, angular stone fragments, light brown, moist                    |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       | 10-12      | S5     | 23                 | 40   | 39    | 48    | 24   | 24   |         |         | S5 - Similar to S4  |
|       |            |        |                    |      |       |       |      |      |         |         |   |
| 15ft  |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       | 15-17      | S6     | 18                 | 33   | 33    | 26    | 24   | 22   |         |         | S6 - Silty SAND (SM), fine, ~20% fines, ~5% fine gravel, gray, moist  |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
| 20ft  |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |

**Remarks:**

1. Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.

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| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/13/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/13/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: Northern edge of northern athletic field |
| Ground Surface El: 766.5 feet (see remark 1)                                   | Total Depth: 16 feet                               |
| Groundwater Depth: ~1.8 ft. at end of drilling                                 | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4-inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata  | Sample Description   |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|---------|--|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |         |  |
| 5ft   | 0-2        | S1     | 4                  | 6    | 9     | 12    | 24   | 13   |         | Topsoil | S1 - Top 6": Silty SAND (SM), fine, ~25% fines, ~5% fine gravel, trace organic fines, trace roots, dark brown, moist                                   |
|       |            |        |                    |      |       |       |      |      |         | Fill    | Bot. 7": Poorly Graded SAND with Silt (SP-SM), fine, ~10% fines, trace fine angular gravel, brown, moist   |
|       | 2-4        | S2     | 12                 | 13   | 11    | 10    | 24   | 16   |         |         | S2 - Silty SAND with Gravel (SM), fine, 15-20% fines, ~15% fine gravel, brown, moist   |
|       | 4-6        | S3     | 16                 | 18   | 16    | 22    | 24   | 12   |         |         | S3 - Silty SAND with Gravel (SM), fine, ~20% fines, ~15% fine gravel, trace roots, brown, moist  |
|       |            |        |                    |      |       |       |      |      |         |         |  |
| 10ft  | 6-8        | S4     | 22                 | 24   | 28    | 49    | 24   | 15   | 2       | -6 ft.  | S4 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine, trace medium, 5-10% fines, 15-20% fine gravel, angular stone fragments, light brown, moist |
|       |            |        |                    |      |       |       |      |      |         |         |  |
|       | 8-10       | S5     | 17                 | 24   | 18    | 55    | 24   | 11   |         |         | S5 - Similar to S4, wet  |
|       |            |        |                    |      |       |       |      |      |         |         |  |
|       |            |        |                    |      |       |       |      |      |         |         |  |
| 15ft  | 14-16      | S6     | 25                 | 30   | 29    | 31    | 24   | 11   | 3       | Sand    | S6 - Silty SAND with Gravel (SM), fine, ~25% fines, ~15% fine gravel, light brown, wet   |
|       |            |        |                    |      |       |       |      |      |         |         |  |
|       |            |        |                    |      |       |       |      |      |         |         |  |
|       |            |        |                    |      |       |       |      |      |         |         |  |
|       |            |        |                    |      |       |       |      |      |         |         |  |
| 20ft  |            |        |                    |      |       |       |      |      |         | -16 ft. |  |
|       |            |        |                    |      |       |       |      |      |         |         |  |
|       |            |        |                    |      |       |       |      |      |         |         |  |
|       |            |        |                    |      |       |       |      |      |         |         |  |
|       |            |        |                    |      |       |       |      |      |         |         |  |
|       |            |        |                    |      |       |       |      |      |         |         | Bottom of boring at 16 feet. Backfilled borehole with drill cuttings.  |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Drill chattered at 7 feet.
- Open hole drive and wash techniques used at 8 feet.

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| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/14/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/14/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: Eastern edge of northern athletic field  |
| Ground Surface El: 765.9 feet (see remark 1)                                   | Total Depth: 34.5 feet                             |
| Groundwater Depth: ~8 ft. at end of drilling                                   | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4-inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata            | Sample Description   |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|-------------------|--|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |                   |  |
| 5ft   | 0-2        | S1     | 10                 | 14   | 10    | 10    | 24   | 23   | 2       | Topsoil<br>~1 ft. | S1 - Top 12": Silty SAND (SM), fine, 20-25% fines, trace fine gravel, trace organic fines, trace roots, dark brown, moist    |
|       |            |        |                    |      |       |       |      |      |         | Subsoil<br>~4 ft. | Bot. 11": Silty SAND (SM), fine, 15-20% fines, ~5% fine gravel, trace roots, brown, moist                                    |
|       | 2-4        | S2     | 10                 | 16   | 13    | 14    | 24   | 21   |         |                   | S2 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine, 10-15% fines, 20-25% fine angular gravel, trace wood, tan, moist |
|       |            |        |                    |      |       |       |      |      |         |                   | S3 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine, 5-10% fines, 15-20% fine gravel, light brown, moist              |
|       | 4-6        | S3     | 9                  | 15   | 17    | 21    | 24   | 13   |         |                   | S4 - Silty SAND (SM), fine, trace medium, ~20% fines, light brown, moist   |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       | 6-6.8      | S4     | 20                 | 60/3 |       |       | 9    | 8    |         |                   |  |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
| 10ft  | 8-10       | S5     | 13                 | 15   | 23    | 23    | 24   | 16   | 3       |                   | S5 - Silty SAND with Gravel (SM), fine, trace medium, 30-35% fines, ~20% fine gravel, light brown, wet                       |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
| 15ft  | 14-16      | S6     | 21                 | 35   | 65    | 56    | 24   | 23   | Sand    |                   | S6 - Silty SAND (SM), fine, trace medium, 15-20% fines, ~10% fine gravel, light brown, wet                                   |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
| 20ft  | 19-21      | S7     | 14                 | 33   | 57    | 64    | 24   | 21   |         |                   | S7 - Silty SAND (SM), fine, trace medium, trace coarse, ~20% fines, ~5% fine gravel, light brown, wet                        |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       | 24-24.8    | S8     | 70                 | 60/4 |       |       | 10   | 10   |         |                   | S8 - Similar to S7, ~15% fines, trace fine angular gravel  |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Open hole drive and wash techniques used at 9 feet.
- Heavy drill chattering starting at 11 feet.

|          |   |  |                        |
|----------|---|--|------------------------|
| Project: | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |  | LGCI Project No.: 1644 |

| Depth<br>Scale | Sample<br>Depth (ft) | Sample<br>No | Blows per 6 inches |      |       |       | Pen<br>(in) | Rec<br>(in) | Remarks | Strata    | Sample Description   |
|----------------|----------------------|--------------|--------------------|------|-------|-------|-------------|-------------|---------|-----------|--|
|                |                      |              | 0-6                | 6-12 | 12-18 | 18-24 |             |             |         |           |  |
| 30 ft          |                      |              |                    |      |       |       |             |             |         | Sand      | S9 - Silty SAND (SM), fine, trace medium, trace coarse, ~15% fines, light brown, wet |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                | 29-29.9              | S9           | 51                 | 75/5 |       |       | 11          | 11          |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
| 35 ft          | 34-34.5              | S10          | 100/6              |      |       |       | 6           | 6           |         | ~34.5 ft. | S10 - Similar to S9, trace fine angular gravel                                       |
|                |                      |              |                    |      |       |       |             |             |         |           | Bottom of boring at 34.5 feet. Backfilled borehole with drill cuttings.              |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
| 40 ft          |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
| 45 ft          |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
| 50 ft          |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |

Remarks:

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| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/23/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/26/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: Southern edge of playground              |
| Ground Surface El: 763.3 feet (see remark 1)                                   | Total Depth: 34.1 feet                             |
| Groundwater Depth: ~5 ft. on 2/23/2018<br>~6 ft. on 2/26/2018                  | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4-inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata         | Sample Description  |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|----------------|---|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |                |   |
| 5ft   | 0-2        | S1     | 4                  | 2    | 3     | 6     | 24   | 9    |         | Asphalt        | Drilled through 3" of asphalt   |
|       |            |        |                    |      |       |       |      |      |         | Fill<br>~4 ft. | S1 - Top 2": Poorly Graded SAND (SP), fine, ~5% fines, ~5% fine gravel, trace organic fines, trace asphalt, orange, moist |
|       | 2-4        | S2     | 19                 | 12   | 18    | 21    | 24   | 16   |         |                | Bot. 7": Silty SAND with Gravel (SM), fine, ~15% fines, ~20% fine gravel, trace organic fines, brown, moist               |
|       | 4-6        | S3     | 28                 | 37   | 27    | 16    | 24   | 10   |         |                | S2 - Silty SAND (SM), fine, trace medium, ~15% fines, trace fine gravel, brown, moist                                     |
| 10ft  |            |        |                    |      |       |       |      |      |         | Sand           | S3 - Silty SAND with Gravel (SM), fine, ~15% fines, ~25% fine gravel, light brown to gray, wet                            |
|       | 6-8        | S4     | 19                 | 16   | 17    | 17    | 24   | 11   |         |                | S4 - Silty SAND (SM), fine, ~20% fines, trace fine gravel, gray, wet  |
|       |            |        |                    |      |       |       |      |      |         |                | S5 - Silty SAND (SM), fine, trace medium, trace coarse, ~25% fines, trace fine gravel, gray, wet                          |
|       | 8-10       | S5     | 13                 | 23   | 24    | 21    | 24   | 18   |         |                |   |
| 15ft  |            |        |                    |      |       |       |      |      | 2       | Sand           |   |
|       |            |        |                    |      |       |       |      |      |         |                |   |
|       |            |        |                    |      |       |       |      |      |         |                |   |
|       | 14-16      | S6     | 10                 | 16   | 17    | 24    | 24   | 19   |         |                | S6 - Similar to S5  |
| 20ft  |            |        |                    |      |       |       |      |      | 3       | Sand           |   |
|       |            |        |                    |      |       |       |      |      |         |                |   |
|       |            |        |                    |      |       |       |      |      |         |                |   |
|       | 19-21      | S7     | 18                 | 33   | 42    | 60    | 24   | 18   |         |                | S7 - Similar to S5  |
|       |            |        |                    |      |       |       |      |      |         |                |   |
|       |            |        |                    |      |       |       |      |      |         |                |   |
|       |            |        |                    |      |       |       |      |      |         |                |   |
|       | 24-26      | S8     | 20                 | 31   | 60    | 59    | 24   | 17   |         |                | S8 - Silty SAND (SM), fine, trace medium, 25-30% fines, trace fine gravel, gray, wet                                      |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Open hole drive and wash techniques used at 14 feet.
- Drill chattered at 16.5 feet.

|          |   |  |                        |
|----------|---|--|------------------------|
| Project: | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |  | LGCI Project No.: 1644 |

| Depth<br>Scale | Sample<br>Depth (ft) | Sample<br>No | Blows per 6 inches |      |       |       | Pen<br>(in) | Rec<br>(in) | Remarks | Strata    | Sample Description  |
|----------------|----------------------|--------------|--------------------|------|-------|-------|-------------|-------------|---------|-----------|---|
|                |                      |              | 0-6                | 6-12 | 12-18 | 18-24 |             |             |         |           |   |
| 30 ft          |                      |              |                    |      |       |       |             |             | 4       | Sand      | S9 - Similar to S8  |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                | 29-30.3              | S9           | 45                 | 59   | 61/4  |       | 16          | 11          |         |           |   |
| 35 ft          |                      |              |                    |      |       |       |             |             |         | ~34.1 ft. | S10 - Silty SAND (SM), fine, 30-35% fines, gray, wet  |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                | 34-34.1              | S10          | 120/1              |      |       |       | 1           | 1           |         |           |   |
| 40 ft          |                      |              |                    |      |       |       |             |             |         |           | Bottom of boring at 34.1 feet. Backfilled borehole with drill cuttings and 2 bags of sand. Restored ground surface with asphalt cold patch. |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
| 45 ft          |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
| 50 ft          |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |

Remarks:

4. Drill chattered at 32 feet.

|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/14/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/15/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: Eastern edge of track                    |
| Ground Surface El: 766.7 feet (see remark 1)                                   | Total Depth: 36 feet                               |
| Groundwater Depth: ~8 ft. at end of drilling                                   | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4-inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata      | Sample Description   |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|-------------|--|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |             |  |
| 5ft   | 0-2        | S1     | 23                 | 35   | 27    | 24    | 24   | 21   | 2       | Asphalt     | S1 - Top 2": Asphalt   |
|       |            |        |                    |      |       |       |      |      |         | Fill ~2 ft. | Bot. 19": Poorly Graded SAND with Silt and Gravel (SP-SM), fine, trace medium, trace coarse, 5-10% fines, ~15% fine gravel, brown, moist |
|       | 2-4        | S2     | 21                 | 20   | 17    | 15    | 24   | 17   |         | Sand        | S2 - Poorly Graded with Silt (SP-SM), fine, 5-10% fines, trace fine angular gravel, light brown, moist                                   |
|       | 4-6        | S3     | 14                 | 12   | 20    | 21    | 24   | 12   |         |             | S3 - Silty SAND (SM), fine, trace medium, 15-20% fines, ~5% fine gravel, light brown, wet  |
|       |            |        |                    |      |       |       |      |      |         |             |  |
| 10ft  | 6-8        | S4     | 21                 | 27   | 24    | 30    | 24   | 14   |         |             | S4 - Poorly Graded SAND with Gravel (SP), fine, 0-5% fines, ~15% fine gravel, light brown, wet   |
|       |            |        |                    |      |       |       |      |      |         |             |  |
|       | 9-11       | S5     | 24                 | 32   | 24    | 34    | 24   | 16   |         |             | S5 - Silty SAND (SM), fine, 15-20% fines, trace fine angular gravel, light brown, wet  |
|       |            |        |                    |      |       |       |      |      |         |             |  |
|       |            |        |                    |      |       |       |      |      |         |             |  |
| 15ft  | 14-16      | S6     | 31                 | 66   | 67    | 88    | 24   | 20   |         |             | S6 - Silty SAND (SM), fine, trace medium, 20-25% fines, trace fine gravel, light brown, wet  |
|       |            |        |                    |      |       |       |      |      |         |             |  |
|       |            |        |                    |      |       |       |      |      |         |             |  |
|       |            |        |                    |      |       |       |      |      |         |             |  |
|       |            |        |                    |      |       |       |      |      |         |             |  |
| 20ft  | 19-21      | S7     | 12                 | 29   | 38    | 45    | 24   | 19   |         |             | S7 - Silty SAND (SM), fine, trace medium, 25-30% fines, trace fine gravel, angular stone fragments, light brown, wet                     |
|       |            |        |                    |      |       |       |      |      |         |             |  |
|       |            |        |                    |      |       |       |      |      |         |             |  |
|       |            |        |                    |      |       |       |      |      |         |             |  |
|       | 24-26      | S8     | 17                 | 28   | 35    | 42    | 24   | 20   |         |             | S8 - Silty SAND (SM), fine, 35-40% fines, trace fine gravel, light brown, wet  |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Drill chattered at 8 feet.



|          |   |  |                        |
|----------|---|--|------------------------|
| Project: | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |  | LGCI Project No.: 1644 |

| Depth<br>Scale | Sample<br>Depth (ft) | Sample<br>No | Blows per 6 inches |      |       |       | Pen<br>(in) | Rec<br>(in) | Remarks | Strata  | Sample Description   |
|----------------|----------------------|--------------|--------------------|------|-------|-------|-------------|-------------|---------|---------|--|
|                |                      |              | 0-6                | 6-12 | 12-18 | 18-24 |             |             |         |         |  |
| 30 ft          |                      |              |                    |      |       |       |             |             |         | Sand    | S9 - Silty SAND (SM), fine, trace medium, ~25% fines, trace fine angular gravel, light brown, wet                      |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                | 29-30.7              | S9           | 29                 | 46   | 71    | 75/2  | 20          | 15          |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
| 35 ft          | 34-36                | S10          | 18                 | 21   | 27    | 33    | 24          | 21          |         | ~36 ft. | S10 - Silty SAND (SM), fine, ~30% fines, light brown, wet  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
| 40 ft          |                      |              |                    |      |       |       |             |             |         |         | Bottom of boring at 36 feet. Backfilled borehole with drill cuttings. Restored ground surface with asphalt cold patch. |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
| 45 ft          |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
| 50 ft          |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |

Remarks:

|   |  |
|---|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b>          |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                                  | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                                    | Date Started: 2/26/2018                            |
| Drilling Foreman: Tim Tucker  | Date Completed: 2/26/2018                          |
| LGCI Engineer: Tom Sinnott  | Location: Wooded area south of track               |
| Ground Surface El: 765.4 feet (see remark 1)  | Total Depth: 35.8 feet                             |
| Groundwater Depth: ~8.2 ft. at end of drilling<br>~13.7 ft. 4.5 hrs. after installation | Drill Rig Type: Mobile B-48 Track Rig              |
|   | Drilling Method: Drive and wash with 4-inch casing |
| Hammer Weight: 140 lbs  | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic  | Rock Core Barrel Size: NA                          |
| Drop: 30 inches   |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata  | Sample Description  |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|---------|---|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |         |   |
| 5ft   | 0-2        | S1     | 1                  | 3    | 6     | 9     | 24   | 12   |         | Topsoil | S1 - Top 5": Silty SAND (SM), fine, 20-25% fines, trace organic fines, trace roots, dark brown, moist                       |
|       |            |        |                    |      |       |       |      |      |         | Fill    | Bot. 7": Silty SAND (SM), fine, ~15% fines, trace fine gravel, brown, moist   |
|       | 2-4        | S2     | 16                 | 20   | 29    | 29    | 24   | 12   |         | ~4 ft.  | S2 - Silty GRAVEL with Sand (GM), fine, angular, 20-25% fines, 35-40% fine to coarse sand, light brown, moist               |
|       | 4-6        | S3     | 20                 | 26   | 19    | 18    | 24   | 12   |         |         | S3 - Poorly Graded SAND with Silt (SP-SM), fine, ~10% fines, 5-10% fine gravel, angular stone fragments, light brown, moist |
| 10ft  | 6-8        | S4     | 18                 | 13   | 12    | 17    | 24   | 8    |         |         | S4 - Silty SAND (SM), fine to coarse, 25-30% fines, 20-25% fine subrounded gravel, light brown, moist                       |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       | 9-11       | S5     | 14                 | 13   | 14    | 15    | 24   | 9    |         |         | S5 - Silty SAND (SM), fine, ~15% fines, trace fine gravel, light brown, moist   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
| 15ft  | 14-16      | S6     | 18                 | 26   | 25    | 17    | 24   | 16   |         | Sand    | S6 - Similar to S5, wet   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
| 20ft  | 19-20.3    | S7     | 36                 | 57   | 63/4  |       | 16   | 14   | 2       |         | S7 - Silty SAND (SM), fine, trace medium, ~15% fines, ~5% fine gravel, light brown, wet                                     |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       | 24-25.3    | S8     | 37                 | 68   | 52/4  |       | 16   | 11   |         |         | S8 - Silty SAND (SM), fine, trace medium, ~15% fines, trace fine gravel, light brown, wet                                   |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Drill chattered at 18 feet.
- Open hole drive and wash techniques used at 19 feet.

|          |   |  |                        |
|----------|---|--|------------------------|
| Project: | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |  | LGCI Project No.: 1644 |

| Depth<br>Scale | Sample<br>Depth (ft) | Sample<br>No | Blows per 6 inches |      |       |       | Pen<br>(in) | Rec<br>(in) | Remarks | Strata    | Sample Description   |
|----------------|----------------------|--------------|--------------------|------|-------|-------|-------------|-------------|---------|-----------|--|
|                |                      |              | 0-6                | 6-12 | 12-18 | 18-24 |             |             |         |           |  |
| 30 ft          |                      |              |                    |      |       |       |             |             |         | Sand      | S9 - Silty SAND (SM), fine, ~15% fines, trace fine gravel, light brown, wet                |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                | 29-30.8              | S9           | 31                 | 49   | 69    | 51/3  | 21          | 15          |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
| 35 ft          | 34-35.8              | S10          | 28                 | 28   | 54    | 66/3  | 21          | 14          |         | ~35.8 ft. | S10 - Silty SAND (SM), fine, trace medium, ~15% fines, trace fine gravel, light brown, wet |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           | Bottom of boring at 35.8 feet. Installed groundwater observation well.                     |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
| 40 ft          |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
| 45 ft          |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
| 50 ft          |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |
|                |                      |              |                    |      |       |       |             |             |         |           |  |

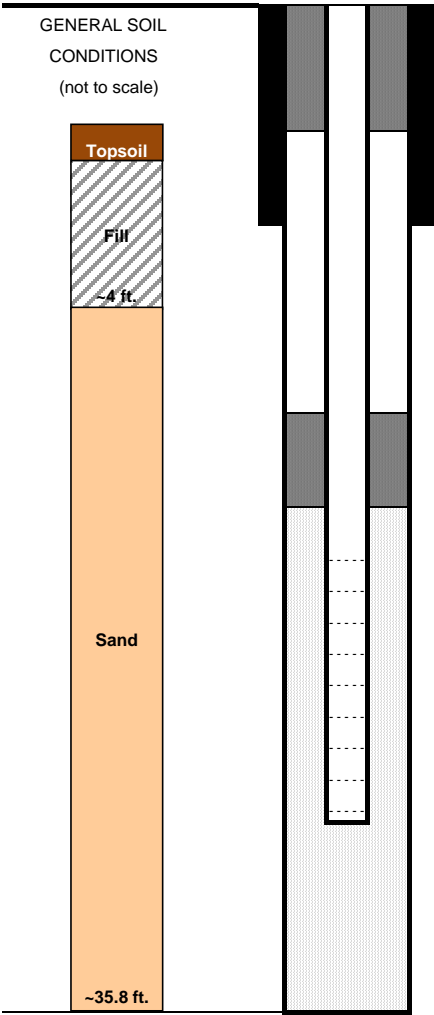
Remarks:

**GROUNDWATER OBSERVATION WELL  
INSTALLATION REPORT**

Boring No. : **B-110-OW**

Page 1/1

|                           |   |                        |                                   |
|---------------------------|---|------------------------|-----------------------------------|
| Project Name:             | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                        |                                   |
| LGCI Project Number:      | <b>1644</b>   |                        |                                   |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                        |                                   |
| Drilling Subcontractor:   | Northern Drill Service, Inc.  | Date Started:          | 2/26/2018                         |
| Drilling Foreman:         | Tim Tucker  | Date Completed:        | 2/26/2018                         |
| LGCI Engineer:            | Tom Sinnott   | Location:              | Wooded area south of track        |
| Ground Surface Elevation: | 765.4 feet (see remark 1)   | Total Depth of Boring: | 35.8 feet                         |
| Ground Water Depth:       | ~12.7 ft. at end of installation                                      | Drill Rig Type:        | Mobile B-48 Track Rig             |
|                           | ~13.7 ft. 4.5 hours after installation                                | Drilling Method:       | Drive and wash with 4-inch casing |

|  |  |  |                         |
|--|--|--|-------------------------|
| <p>GENERAL SOIL CONDITIONS (not to scale)</p>  |  | Riser Stickup ~0' above ground surface |                         |
|  | THICKNESS OF SURFACE SEAL                |  | 5 inch                  |
|  | TYPE OF SURFACE SEAL                     |  | Concrete                |
|  | TYPE OF SURFACE CASING                   |  | Aluminum road box       |
|  | ID OF SURFACE CASING                     |  | 6 inch                  |
|  | DEPTH TO BOTTOM OF CASING                |  | 1 foot                  |
|  | ID OF RISER PIPE                         |  | 2 inch                  |
|  | TYPE OF RISER PIPE                       |  | Schedule 40 PVC         |
|  | TYPE OF BACKFILL AROUND RISER PIPE       |  | Holliston sand          |
|  | DEPTH TO TOP OF SEAL                     |  | 20 feet                 |
|  | TYPE OF SEAL                             |  | Bentonite chips         |
|  | DEPTH TO BOTTOM OF SEAL                  |  | 22 feet                 |
|  | DEPTH TO TOP OF PERVIOUS SECTION         |  | 25 feet                 |
|  | TYPE OF PERVIOUS SECTION                 |  | Schedule 40 PVC         |
|  | DESCRIBE OPENINGS                        |  | 0.01 inch slots         |
|  | ID OF PERVIOUS SECTION                   |  | 2 inch                  |
|  | TYPE OF BACKFILL AROUND PERVIOUS SECTION |  | Holliston sand (4 bags) |
|  | DEPTH TO BOTTOM OF PERVIOUS SECTION      |  | 35 feet                 |
|  | DEPTH TO BOTTOM OF SAND COLUMN           |  | 35.8 feet               |
|  | TYPE OF BACKFILL BELOW PERVIOUS SECTION  |  | Holliston sand          |
|  | DIAMETER OF BOREHOLE                     |  | 9 inch                  |
|  | DEPTH TO BOTTOM OF BOREHOLE              |  | 35.8 feet               |

Remarks: 1. Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.

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| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                     |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/21/2018                    |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/21/2018                  |
| LGCI Engineer: Tom Sinnott   | Location: NE corner of lower parking lot   |
| Ground Surface El: 749.6 feet (see remark 1)                                   | Total Depth: 15 feet                       |
| Groundwater Depth: NE  | Drill Rig Type: Mobile B-48 Track Rig      |
|  | Drilling Method: HSA (3-1/4" ID)           |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2" |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                  |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata          | Sample Description   |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|-----------------|--|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |                 |  |
| 5ft   | 0.5-2      | S1     |                    | 5    | 6     | 4     | 18   | 9    |         | Asphalt Fill    | Drilled through 3" of asphalt  |
|       |            |        |                    |      |       |       |      |      |         | Buried Organics | S1 - Top 5": Silty SAND (SM), fine, ~15% fines, trace fine angular gravel, trace asphalt, brown, moist                               |
|       | 2-4        | S2     | 5                  | 5    | 4     | 5     | 24   | 10   |         |                 | Bot. 4": Silty SAND (SM), fine, ~30% fines, trace fine gravel, trace organic fines, black, moist                                     |
|       | 4-6        | S3     | 3                  | 3    | 2     | 2     | 24   | 7    |         |                 | S2 - Similar to Bot. 4" of S1, trace roots, trace wood   |
|       |            |        |                    |      |       |       |      |      |         |                 | S3 - Similar to S2   |
| 10ft  | 6-8        | S4     | 3                  | 3    | 3     | 42    | 24   | 10   |         | ~8 ft.          | S4 - Similar to S2, trace fine angular gravel  |
|       |            |        |                    |      |       |       |      |      |         |                 |  |
|       | 8-10       | S5     | 15                 | 26   | 20    | 19    | 24   | 18   |         |                 | S5 - Poorly Graded SAND with Silt (SP-SM), fine, trace medium, 10-15% fines, 5-10% fine gravel, angular stone fragments, gray, moist |
|       |            |        |                    |      |       |       |      |      |         |                 |  |
|       |            |        |                    |      |       |       |      |      |         |                 |  |
| 15ft  | 13-15      | S6     | 13                 | 17   | 24    | 57    | 24   | 22   |         | Sand            | S6 - Silty SAND (SM), fine, ~15% fines, light brown to gray, moist   |
|       |            |        |                    |      |       |       |      |      |         |                 |  |
|       |            |        |                    |      |       |       |      |      |         |                 |  |
|       |            |        |                    |      |       |       |      |      |         |                 |  |
|       |            |        |                    |      |       |       |      |      |         |                 |  |
| 20ft  |            |        |                    |      |       |       |      |      |         | ~15 ft.         |  |
|       |            |        |                    |      |       |       |      |      |         |                 |  |
|       |            |        |                    |      |       |       |      |      |         |                 |  |
|       |            |        |                    |      |       |       |      |      |         |                 |  |
|       |            |        |                    |      |       |       |      |      |         |                 |  |
|       |            |        |                    |      |       |       |      |      |         |                 | Bottom of boring at 15 feet. Backfilled borehole with drill cuttings. Restored ground surface with asphalt cold patch.               |

**Remarks:**

1. Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.

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| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |   |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                      |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/21/2018                     |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/21/2018                   |
| LGCI Engineer: Tom Sinnott   | Location: Western edge of lower parking lot |
| Ground Surface El: 748.6 feet (see remark 1)                                   | Total Depth: 15 feet                        |
| Groundwater Depth: NE  | Drill Rig Type: Mobile B-48 Track Rig       |
|  | Drilling Method: HSA (3-1/4" ID)            |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"  |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                   |
| Drop: 30 inches  |   |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |      |       |       | Pen (in) | Rec (in) | Remarks | Strata  | Sample Description  |
|-------------|-------------------|-----------|--------------------|------|-------|-------|----------|----------|---------|---------|---|
|             |                   |           | 0-6                | 6-12 | 12-18 | 18-24 |          |          |         |         |   |
| 5ft         | 0.5-2             | S1        |                    | 2    | 5     | 5     | 18       | 10       |         | Asphalt | Drilled through 2" of asphalt   |
|             |                   |           |                    |      |       |       |          |          |         |         | S1 - Silty SAND (SM), fine, ~20% fines, trace fine gravel, light brown, moist   |
|             | 2-4               | S2        | 2                  | 8    | 15    | 16    | 24       | 15       |         |         | S2 - Similar to S1, angular stone fragments   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
| 10ft        | 4-6               | S3        | 11                 | 11   | 58    | 26    | 24       | 8        |         | Fill    | S3 - Silty SAND with Gravel (SM), fine, trace medium, ~15% fines, ~15% fine to coarse gravel, angular stone fragments, brown, moist |
|             |                   |           |                    |      |       |       |          |          |         |         | S4 - Silty SAND (SM), fine, 20-25% fines, ~5% fine gravel, brown, moist   |
|             | 6-8               | S4        | 14                 | 9    | 9     | 11    | 24       | 13       |         |         |   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
| 15ft        | 8-10              | S5        | 8                  | 15   | 22    | 26    | 24       | 18       |         | ~8 ft.  | S5 - Silty SAND (SM), fine, 20-25% fines, trace fine gravel, light brown to gray, moist   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
| 20ft        | 13-15             | S6        | 19                 | 26   | 24    | 27    | 24       | 20       |         | Sand    | S6 - Silty SAND (SM), fine, 15-20% fines, trace fine gravel, gray, moist  |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
|             |                   |           |                    |      |       |       |          |          |         | ~15 ft. | Bottom of boring at 15 feet. Backfilled borehole with drill cuttings. Restored ground surface with asphalt cold patch.              |

**Remarks:**

1. Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.

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| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |   |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                      |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/21/2018                     |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/22/2018                   |
| LGCI Engineer: Tom Sinnott   | Location: Eastern edge of lower parking lot |
| Ground Surface El: 745.7 feet (see remark 1)                                   | Total Depth: 14.5 feet                      |
| Groundwater Depth: ~14.3 ft. at end of drilling                                | Drill Rig Type: Mobile B-48 Track Rig       |
|  | Drilling Method: HSA (3-1/4" ID)            |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"  |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                   |
| Drop: 30 inches  |   |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata            | Sample Description  |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|-------------------|---|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |                   |   |
| 5ft   | 0-2        | S1     | WOH                | 4    | 7     | 9     | 24   | 16   | 2       | Topsoil<br>~2 ft. | S1 - Silty SAND (SM), fine, ~20% fines, trace fine gravel, trace roots, trace asphalt, trace brick, trace fabric, dark brown, moist |
|       |            |        |                    |      |       |       |      |      |         |                   | S2 - Silty SAND (SM), fine, trace medium, ~20% fines, ~5% fine gravel, trace organic fines, trace roots, brown, moist               |
|       | 2-4        | S2     | 9                  | 9    | 8     | 6     | 24   | 17   |         |                   |   |
|       | 4-6        | S3     | 2                  | 5    | 6     | 8     | 24   | 18   |         |                   |   |
| 10ft  | 6-8        | S4     | 7                  | 13   | 11    | 10    | 24   | 4    | 3       | Fill<br>~12 ft.   | S3 - Silty SAND (SM), fine, 15-20% fines, ~5% fine angular gravel, brown, moist   |
|       |            |        |                    |      |       |       |      |      |         |                   | S4 - Similar to S3, trace fine gravel   |
|       | 8-10       | S5     | 5                  | 3    | 5     | 5     | 24   | 11   |         |                   | S5 - Silty SAND (SM), fine, 20-25% fines, trace fine gravel, trace wood, brown, moist   |
|       | 10-12      | S6     | 4                  | 16   | 51    | 7     | 24   | 13   |         |                   | S6 - Top 6": Silty SAND (SM), fine, 30-35% fines, trace wood, dark brown to gray, moist   |
| 15ft  | 12-13.8    | S7     | 5                  | 22   | 25    | 95/3  | 21   | 10   | 4       | Sand<br>~14.5 ft. | Bot. 7": Fine angular gravel  |
|       |            |        |                    |      |       |       |      |      |         |                   | S7 - Silty SAND (SM), fine, trace medium, ~20% fines, trace fine angular gravel, angular stone fragments, dark brown, moist         |
|       | 14.5-      | S8     | 120/0              |      |       |       | 0    | 0    |         |                   | S8 - No recovery  |
|       | 14.5       |        |                    |      |       |       |      |      |         |                   |   |
| 20ft  |            |        |                    |      |       |       |      |      |         |                   | Bottom of boring at 14.5 feet. Backfilled borehole with drill cuttings.   |
|       |            |        |                    |      |       |       |      |      |         |                   |   |
|       |            |        |                    |      |       |       |      |      |         |                   |   |
|       |            |        |                    |      |       |       |      |      |         |                   |   |
|       |            |        |                    |      |       |       |      |      |         |                   |   |
|       |            |        |                    |      |       |       |      |      |         |                   |   |
|       |            |        |                    |      |       |       |      |      |         |                   |   |
|       |            |        |                    |      |       |       |      |      |         |                   |   |

**Remarks:**

- Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," dated March 26, 2018 and provided to LGCI by Nitsch Engineering, Inc. via email on March 28, 2018.
- Boring location offset 15 feet to the west of original location. Alternate location is approximately 5 feet higher in elevation than the original location.
- Drill chattered at 7 feet.

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| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                     |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/21/2018                    |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/21/2018                  |
| LGCI Engineer: Tom Sinnott   | Location: SW corner of lower parking lot   |
| Ground Surface El: 745.6 feet (see remark 1)                                   | Total Depth: 15 feet                       |
| Groundwater Depth: NE  | Drill Rig Type: Mobile B-48 Track Rig      |
|  | Drilling Method: HSA (3-1/4" ID)           |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2" |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                  |
| Drop: 30 inches  |  |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |      |       |       | Pen (in) | Rec (in) | Remarks | Strata  | Sample Description   |
|-------------|-------------------|-----------|--------------------|------|-------|-------|----------|----------|---------|---------|--|
|             |                   |           | 0-6                | 6-12 | 12-18 | 18-24 |          |          |         |         |  |
| 5ft         | 0.5-2             | S1        |                    | 5    | 8     | 9     | 18       | 14       |         | Asphalt | Drilled through 3" of asphalt  |
|             |                   |           |                    |      |       |       |          |          |         | Fill    | S1 - Silty SAND (SM), fine, ~20% fines, trace fine gravel, trace asphalt, light brown, moist                           |
|             | 2-4               | S2        | 10                 | 14   | 12    | 10    | 24       | 17       |         | ~4 ft.  | S2 - Silty SAND (SM), fine, 15-20% fines, brown, moist   |
| 10ft        | 4-6               | S3        | 8                  | 13   | 12    | 9     | 24       | 20       |         | Sand    | S3 - Poorly Graded SAND with Silt (SP-SM), fine, trace medium, trace coarse, 10-15% fines, light brown, moist          |
|             | 6-8               | S4        | 13                 | 14   | 14    | 11    | 24       | 21       |         |         | S4 - Similar to S3   |
|             | 8-10              | S5        | 5                  | 8    | 7     | 16    | 24       | 18       |         |         | S5 - Silty SAND (SM), fine, ~15% fines, light brown, moist   |
| 15ft        | 13-15             | S6        | 20                 | 19   | 25    | 30    | 24       | 23       |         | ~15 ft. | S6 - Similar to S5, trace fine angular gravel, light brown to gray   |
|             |                   |           |                    |      |       |       |          |          |         |         |  |
|             |                   |           |                    |      |       |       |          |          |         |         |  |
| 20ft        |                   |           |                    |      |       |       |          |          |         |         | Bottom of boring at 15 feet. Backfilled borehole with drill cuttings. Restored ground surface with asphalt cold patch. |
|             |                   |           |                    |      |       |       |          |          |         |         |  |
|             |                   |           |                    |      |       |       |          |          |         |         |  |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.



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| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                     |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/22/2018                    |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/22/2018                  |
| LGCI Engineer: Tom Sinnott   | Location: SE corner of lower parking lot   |
| Ground Surface El: 741.1 feet (see remark 1)                                   | Total Depth: 19.2 feet                     |
| Groundwater Depth: NE  | Drill Rig Type: Mobile B-48 Track Rig      |
|  | Drilling Method: HSA (3-1/4" ID)           |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2" |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                  |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata            | Sample Description   |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|-------------------|--|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |                   |  |
| 5ft   | 0-2        | S1     | 1                  | 5    | 8     | 9     | 24   | 17   | 2       | Topsoil           | S1 - Top 5": Silty SAND (SM), fine, ~25% fines, trace organic fines, trace roots, trace leaves, dark brown, moist            |
|       |            |        |                    |      |       |       |      |      |         |                   | Bot. 12": Silty SAND (SM), fine, ~20% fines, trace wood, brown, moist  |
|       | 2-4        | S2     | 10                 | 16   | 22    | 21    | 24   | 18   |         | Fill              | S2 - Silty SAND (SM), fine, 15-20% fines, ~5% fine angular gravel, brown, moist  |
|       | 4-6        | S3     | 7                  | 6    | 6     | 5     | 24   | 14   |         |                   | S3 - Silty SAND (SM), fine, ~20% fines, gray, moist  |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       | 6-8        | S4     | 7                  | 8    | 7     | 12    | 24   | 13   |         |                   | S4 - Silty SAND (SM), fine, 30-35% fines, trace fine gravel, trace organic fines, trace wood, trace roots, dark brown, moist |
| 10ft  |            |        |                    |      |       |       |      |      |         |                   |  |
|       | 8-9.3      | S5     | 5                  | 6    | 120/3 |       | 15   | 7    |         |                   | S5 - Similar to S4, trace fine angular gravel  |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       | 10-11.7    | S6     | 1                  | 2    | 73    | 47/2  | 20   | 9    |         |                   | S6 - Similar to S4   |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
| 15ft  |            |        |                    |      |       |       |      |      | 3       | ~12 ft.           |  |
|       |            |        |                    |      |       |       |      |      |         | Boulder ~13 ft.   |  |
|       | 13-14.3    | S7     | 6                  | 5    | 60/3  |       | 15   | 7    |         | Fill              | S7 - Silty SAND (SM), fine, 15-20% fines, trace fine angular gravel, trace wood, trace roots, brown, moist                   |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       | 16.5-      | S8     | 120/3              |      |       |       | 3    | 0    |         | ~16.5 ft.         | S8 - No recovery   |
| 20ft  | 16.8       |        |                    |      |       |       |      |      |         | Boulder ~16.5 ft. |  |
|       | 17.5-      | S9     | 30                 | 44   | 61    | 59/4  | 22   | 12   |         | Sand ~19.2 ft.    | S9 - Silty SAND (SM), fine, 15-20% fines, 5-10% fine gravel, angular stone fragments, gray, moist                            |
|       | 19.2       |        |                    |      |       |       |      |      |         |                   |  |
|       |            |        |                    |      |       |       |      |      |         |                   |  |
|       |            |        |                    |      |       |       |      |      |         |                   | Bottom of boring at 19.2 feet. Backfilled borehole with drill cuttings and 2 bags of sand.                                   |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Offset borehole 3 feet west.
- Split spoon sampler bouncing; drillers stopped sampling to avoid equipment damage.

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| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/26/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/27/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: Northern edge of existing school         |
| Ground Surface El: 767.4 feet (see remark 1)                                   | Total Depth: 39 feet                               |
| Groundwater Depth: ~7.2 ft. on 2/26/2018                                       | Drill Rig Type: Mobile B-48 Track Rig              |
| ~7.5 ft. at end of drilling  | Drilling Method: Drive and wash with 4-inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata         | Sample Description   |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|----------------|--|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |                |  |
| 5ft   | 0.5-2      | S1     |                    | 3    | 4     | 7     | 18   | 6    |         | Concrete       | Drilled through 4" of concrete   |
|       |            |        |                    |      |       |       |      |      |         | Fill<br>~4 ft. | S1 - Silty SAND (SM), fine, ~25% fines, trace roots, trace organic fines, brown, wet                           |
|       | 2-4        | S2     | 8                  | 9    | 12    | 14    | 24   | 15   |         |                | S2 - Silty SAND (SM), fine, 15-20% fines, ~5% fine gravel, trace organic fines, brown, wet                     |
|       | 4-6        | S3     | 15                 | 16   | 16    | 13    | 24   | 12   |         |                |  |
| 10ft  | 6-8        | S4     | 12                 | 14   | 20    | 25    | 24   | 19   | 2       | Sand           | S3 - Poorly Graded SAND with Silt (SP-SM), fine, trace medium, 10-15% fines, ~5% fine gravel, light brown, wet |
|       |            |        |                    |      |       |       |      |      |         |                | S4 - Silty SAND (SM), fine, ~15% fines, 5-10% fine gravel, light brown, wet                                    |
|       | 8-10       | S5     | 16                 | 21   | 27    | 46    | 24   | 14   |         |                | S5 - Silty SAND (SM), fine, 15-20% fines, trace fine gravel, light brown, wet                                  |
|       |            |        |                    |      |       |       |      |      |         |                |  |
| 15ft  | 14-16      | S6     | 22                 | 26   | 33    | 40    | 24   | 15   |         |                | S6 - Silty SAND (SM), fine, 20-25% fines, trace fine gravel, light brown, moist                                |
|       |            |        |                    |      |       |       |      |      |         |                |  |
|       |            |        |                    |      |       |       |      |      |         |                |  |
|       |            |        |                    |      |       |       |      |      |         |                |  |
| 20ft  | 19-21      | S7     | 25                 | 43   | 64    | 37    | 24   | 16   |         |                | S7 - Silty SAND (SM), fine, 25-30% fines, trace fine gravel, angular stone fragments, gray, wet                |
|       |            |        |                    |      |       |       |      |      |         |                |  |
|       |            |        |                    |      |       |       |      |      |         |                |  |
|       |            |        |                    |      |       |       |      |      |         |                |  |
|       | 24-25.8    | S8     | 28                 | 37   | 72    | 48/3  | 21   | 16   |         |                | S8 - Silty SAND (SM), fine, trace medium, trace coarse, 25-30% fines, trace fine gravel, gray, wet             |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Drill chattered at 13 feet.
- Open hole drive and wash techniques used at 14 feet.

|          |   |  |                        |
|----------|---|--|------------------------|
| Project: | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |  | LGCI Project No.: 1644 |

| Depth<br>Scale | Sample<br>Depth (ft) | Sample<br>No | Blows per 6 inches |      |       |       | Pen<br>(in) | Rec<br>(in) | Remarks | Strata  | Sample Description  |
|----------------|----------------------|--------------|--------------------|------|-------|-------|-------------|-------------|---------|---------|---|
|                |                      |              | 0-6                | 6-12 | 12-18 | 18-24 |             |             |         |         |   |
| 30 ft          |                      |              |                    |      |       |       |             |             | 4       | Sand    | S9 - Similar to S8  |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                | 29-30.7              | S9           | 15                 | 36   | 70    | 50/2  | 20          | 12          |         |         |   |
| 35 ft          |                      |              |                    |      |       |       |             |             | 5       | ~39 ft. | S10 - Silty SAND (SM), fine, ~30% fines, trace fine gravel, gray, wet |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                | 34-34.8              | S10          | 73                 | 47/2 |       |       | 8           | 8           |         |         |   |
| 40 ft          |                      |              |                    |      |       |       |             |             |         |         | Bottom of boring at 39 feet. Backfilled borehole with drill cuttings. |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
| 45 ft          |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
| 50 ft          |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |

Remarks:

- Drill chattered at 30 feet.
- Borehole collapse at 30 feet after washing to 39 feet. Possible boulder fell into borehole causing the collapse.

|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/27/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/27/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: Northern edge of existing school         |
| Ground Surface El: 769.5 feet (see remark 1)                                   | Total Depth: 41 feet                               |
| Groundwater Depth: ~8 ft. at end of drilling                                   | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4-inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks   | Strata   | Sample Description  |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---|--|---|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |   |  |   |
| 5ft   | 0-2        | S1     | 1                  | 3    | 4     | 6     | 24   | 3    | <div>Topsoil<br/>~2 ft.</div> <div><div></div></div> <div>Fill<br/>~8 ft.</div> | S1 - Silty SAND (SM), fine, ~30% fines, trace fine gravel, trace organic fines, trace roots, dark brown, moist           |   |
|       |            |        |                    |      |       |       |      |      |   | S2 - Silty SAND with Gravel (SM), fine, 15-20% fines, ~15% fine angular gravel, brown, moist                             |   |
|       | 2-4        | S2     | 18                 | 19   | 17    | 17    | 24   | 8    |   | S3 - Silty SAND (SM), fine, 15-20% fines, trace fine gravel, trace roots, trace wood, angular stone fragments, gray, wet |   |
|       |            |        |                    |      |       |       |      |      |   | S4 - Silty SAND (SM), fine, 20-25% fines, trace fine angular gravel, gray, wet   |   |
|       | 4-6        | S3     | 13                 | 10   | 11    | 47    | 24   | 13   |   | S5 - Silty SAND (SM), fine, ~15% fines, 10-15% fine subangular gravel, light brown, wet                                  |   |
|       |            |        |                    |      |       |       |      |      |   |  |   |
| 10ft  | 6-6.3      | S4     | 120/4              |      |       |       | 4    | 4    | 2   |  |   |
|       |            |        |                    |      |       |       |      |      |   |  |   |
|       | 8-10       | S5     | 13                 | 15   | 23    | 15    | 24   | 12   |   |  |   |
|       |            |        |                    |      |       |       |      |      |   |  |   |
|       |            |        |                    |      |       |       |      |      |   |  |   |
|       |            |        |                    |      |       |       |      |      |   |  |   |
| 15ft  | 14-16      | S6     | 9                  | 11   | 8     | 16    | 24   | 15   | 3   | Sand   | S6 - Silty SAND (SM), fine, ~20% fines, trace fine gravel, light brown, wet                 |
|       |            |        |                    |      |       |       |      |      |   |  |   |
|       |            |        |                    |      |       |       |      |      |   |  |   |
|       |            |        |                    |      |       |       |      |      |   |  |   |
|       |            |        |                    |      |       |       |      |      |   |  |   |
|       |            |        |                    |      |       |       |      |      |   |  |   |
| 20ft  | 19-21      | S7     | 25                 | 39   | 45    | 37    | 24   | 22   |   |  | S7 - Silty SAND (SM), fine, trace medium, 15-20% fines, trace fine gravel, light brown, wet |
|       |            |        |                    |      |       |       |      |      |   |  |   |
|       |            |        |                    |      |       |       |      |      |   |  |   |
|       |            |        |                    |      |       |       |      |      |   |  |   |
|       |            |        |                    |      |       |       |      |      |   |  |   |
|       |            |        |                    |      |       |       |      |      |   |  |   |
|       | 24-26      | S8     | 22                 | 24   | 40    | 53    | 24   | 19   |   | S8 - Similar to S7, gray   |   |

**Remarks:**

- Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," dated March 26, 2018 and provided to LGCI by Nitsch Engineering, Inc. via email on March 28, 2018.
- Drill chattered at 12 feet.
- Open hole drive and wash technique used at 18.5 feet.

|          |   |  |                        |
|----------|---|--|------------------------|
| Project: | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |  | LGCI Project No.: 1644 |

| Depth<br>Scale | Sample<br>Depth (ft) | Sample<br>No | Blows per 6 inches |      |       |       | Pen<br>(in) | Rec<br>(in) | Remarks | Strata  | Sample Description  |
|----------------|----------------------|--------------|--------------------|------|-------|-------|-------------|-------------|---------|---------|---|
|                |                      |              | 0-6                | 6-12 | 12-18 | 18-24 |             |             |         |         |   |
| 30 ft          |                      |              |                    |      |       |       |             |             |         | Sand    | S9 - Silty SAND (SM), fine, trace medium, 20-25% fines, trace fine gravel, angular stone fragments, gray, wet |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
| 35 ft          | 29-31                | S9           | 32                 | 76   | 41    | 40    | 24          | 14          |         |         | S10 - Silty SAND (SM), fine, trace medium, ~25% fines, ~5% fine gravel, gray, wet                             |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
| 40 ft          | 34-36                | S10          | 11                 | 19   | 23    | 32    | 24          | 13          |         |         | S11 - Silty SAND (SM), fine, trace medium, ~25% fines, trace fine gravel, gray to brown, wet                  |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
| 45 ft          | 39-41                | S11          | 23                 | 33   | 39    | 54    | 24          | 20          |         | ~41 ft. | Bottom of boring at 41 feet. Backfilled borehole with drill cuttings.   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
| 50 ft          |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |

Remarks:

|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b>           |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                                   | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                                     | Date Started: 2/27/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/27/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: NE corner of existing school             |
| Ground Surface El: 775 feet (See remark 1)   | Total Depth: 41 feet                               |
| Groundwater Depth: ~13.2 ft. at end of drilling<br>~12.5 ft. 5.5 hrs. after installation | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4-inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |      |       |       | Pen (in) | Rec (in) | Remarks | Strata   | Sample Description   |
|-------------|-------------------|-----------|--------------------|------|-------|-------|----------|----------|---------|----------|--|
|             |                   |           | 0-6                | 6-12 | 12-18 | 18-24 |          |          |         |          |  |
| 5ft         | 0-2               | S1        | 1                  | 6    | 43    | 10    | 24       | 9        | 2       | Topsoil  | S1 - Silty SAND (SM), fine, 20-25% fines, trace organic fines, trace roots, angular stone fragments, dark brown, moist   |
|             | 2-2.7             | S2        | 35                 | 60/1 |       |       | 7        | 4        |         | ~2.7 ft. | S2 - Similar to S1, dark brown to brown  |
|             | 4-6               | S3        | 8                  | 8    | 11    | 14    | 24       | 5        | 3       | Fill     | S3 - Silty SAND (SM), fine, trace medium, ~25% fines, trace fine gravel, brown, wet                                      |
|             | 6-8               | S4        | 25                 | 56   | 43    | 22    | 24       | 14       |         | ~6 ft.   |  |
|             | 8-9.1             | S5        | 21                 | 58   | 62/2  |       | 14       | 10       | 4       |          |  |
| 10ft        |                   |           |                    |      |       |       |          |          | 5       | Sand     | S4 - Silty GRAVEL with Sand (GM), fine to coarse, subrounded, 25-30% fines, 35-40% fine to coarse sand, light brown, wet |
|             |                   |           |                    |      |       |       |          |          |         |          | S5 - Silty SAND (SM), fine, ~15% fines, trace fine gravel, light brown to brown, wet                                     |
|             |                   |           |                    |      |       |       |          |          |         |          |  |
|             |                   |           |                    |      |       |       |          |          |         |          |  |
|             |                   |           |                    |      |       |       |          |          |         |          |  |
| 15ft        | 14-16             | S6        | 8                  | 7    | 14    | 39    | 24       | 15       |         |          | S6 - Silty SAND (SM), fine, trace medium, 20-25% fines, light brown, wet   |
|             |                   |           |                    |      |       |       |          |          |         |          |  |
|             |                   |           |                    |      |       |       |          |          |         |          |  |
|             |                   |           |                    |      |       |       |          |          |         |          |  |
|             |                   |           |                    |      |       |       |          |          |         |          |  |
| 20ft        | 19-21             | S7        | 10                 | 25   | 22    | 28    | 24       | 13       |         |          | S7 - Silty SAND (SM), fine, trace medium, 20-25% fines, trace fine gravel, light brown, wet                              |
|             |                   |           |                    |      |       |       |          |          |         |          |  |
|             |                   |           |                    |      |       |       |          |          |         |          |  |
|             |                   |           |                    |      |       |       |          |          |         |          |  |
|             | 24-26             | S8        | 18                 | 24   | 25    | 54    | 24       | 18       |         |          | S8 - Silty SAND (SM), fine, trace medium, trace coarse, ~25% fines, gray, wet  |

**Remarks:**

- Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," dated March 26, 2018 and provided to LGCI by Nitsch Engineering, Inc. via email on March 28, 2018.
- Encountered boulder at 2.5 feet. Offset boring 2 feet west.
- Open hole drive and wash technique used at 9 feet.
- Heavy drill chattering from 9.5 feet to 11 feet due to possible boulder.
- Switched to 3 inch casing; open hole drive and wash technique used at 24 feet.

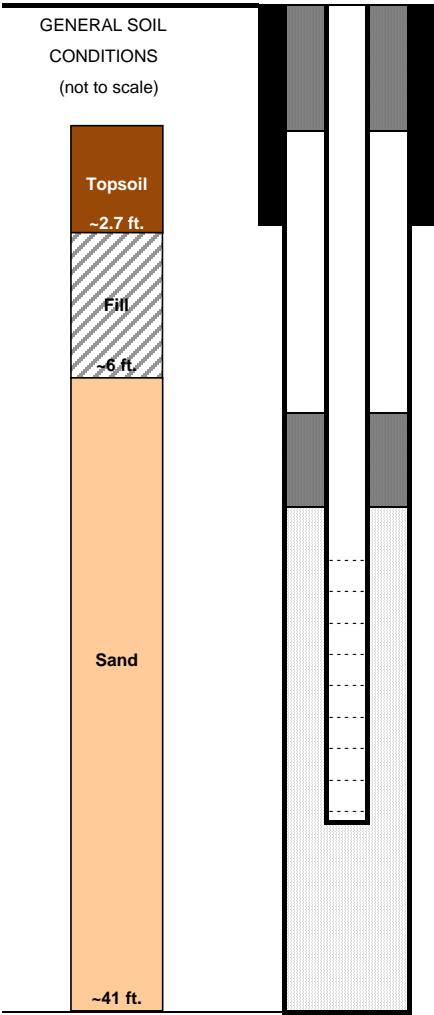


**GROUNDWATER OBSERVATION WELL  
INSTALLATION REPORT**

Boring No. : **B-118B-OW**

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|   |  |                        |                                   |
|---|--|------------------------|-----------------------------------|
| Project Name: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |                                   |
| LGCI Project Number: <b>1644</b>  |  |                        |                                   |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                              |  |                        |                                   |
| Drilling Subcontractor:   | Northern Drill Service, Inc.           | Date Started:          | 2/28/2018                         |
| Drilling Foreman:   | Tim Tucker                             | Date Completed:        | 2/28/2018                         |
| LGCI Engineer:  | Tom Sinnott                            | Location:              | NE corner of existing school      |
| Ground Surface Elevation:   | 775.0 feet (see remark 1)              | Total Depth of Boring: | 41 feet                           |
| Ground Water Depth:   | ~8.9 ft. at end of installation        | Drill Rig Type:        | Mobile B-48 Track Rig             |
|   | ~12.8 ft. 5.5 hours after installation | Drilling Method:       | Drive and wash with 4-inch casing |

|  |  |  |                         |
|--|--|--|-------------------------|
| GENERAL SOIL<br>CONDITIONS<br>(not to scale)                                       |  | Riser Stickup ~0' above ground surface   |                         |
|  |  | THICKNESS OF SURFACE SEAL                | 5 inch                  |
|  |  | TYPE OF SURFACE SEAL                     | Concrete                |
|  |  | TYPE OF SURFACE CASING                   | Roadway box             |
|  |  | ID OF SURFACE CASING                     | 6 inch                  |
|  |  | DEPTH TO BOTTOM OF CASING                | 1 foot                  |
|  |  | ID OF RISER PIPE                         | 2 inch                  |
|  |  | TYPE OF RISER PIPE                       | Schedule 40 PVC         |
|  |  | TYPE OF BACKFILL AROUND RISER PIPE       | Holliston sand          |
|  |  | DEPTH TO TOP OF SEAL                     | 25 feet                 |
|  |  | TYPE OF SEAL                             | Bentonite chips         |
|  |  | DEPTH TO BOTTOM OF SEAL                  | 27 feet                 |
|  |  | DEPTH TO TOP OF PERVIOUS SECTION         | 30 feet                 |
|  |  | TYPE OF PERVIOUS SECTION                 | Schedule 40 PVC         |
|  |  | DESCRIBE OPENINGS                        | 0.01 inch slots         |
|  |  | ID OF PERVIOUS SECTION                   | 2 inch                  |
|  |  | TYPE OF BACKFILL AROUND PERVIOUS SECTION | Holliston sand (2 bags) |
|  |  | DEPTH TO BOTTOM OF PERVIOUS SECTION      | 40 feet                 |
|  |  | DEPTH TO BOTTOM OF SAND COLUMN           | 41 feet                 |
|  |  | TYPE OF BACKFILL BELOW PERVIOUS SECTION  | Holliston sand          |
|  |  | DIAMETER OF BOREHOLE                     | 4 inch                  |
|  |  | DEPTH TO BOTTOM OF BOREHOLE              | ~41 feet                |

Remarks:

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," dated March 26, 2018 and provided to LGCI by Nitsch Engineering, Inc. via email on March 28, 2018.



|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/28/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/28/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: Eastern edge of existing school          |
| Ground Surface El: 777.7 feet (See remark 1)                                   | Total Depth: 41 feet                               |
| Groundwater Depth: ~8 ft. at end of drilling                                   | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4-inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata             | Sample Description  |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|--------------------|---|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |                    |   |
| 5ft   | 0-2        | S1     | 1                  | 3    | 2     | 2     | 24   | 15   |         | Topsoil<br>~4 ft.  | S1 - Silty SAND (SM), fine, 20-25% fines, trace fine gravel, trace organic fines, trace roots, dark brown, moist                      |
|       |            |        |                    |      |       |       |      |      |         |                    | S2 - Silty SAND (SM), fine, ~25% fines, ~5% fine gravel, trace organic fines, trace roots, dark brown, moist                          |
|       | 2-4        | S2     | 2                  | 3    | 2     | 17    | 24   | 18   |         |                    |   |
|       |            |        |                    |      |       |       |      |      |         |                    |   |
| 10ft  | 4-6        | S3     | 16                 | 8    | 9     | 11    | 24   | 9    |         | Fill<br>~8 ft.     | S3 - Silty SAND (SM), fine, 20-25% fines, trace fine gravel, trace organic fines, brown, wet  |
|       |            |        |                    |      |       |       |      |      |         |                    | S4 - Silty SAND with Gravel (SM), fine to coarse, 25-30% fines, 30-35% fine to coarse angular gravel, trace organic fines, brown, wet |
|       | 6-8        | S4     | 11                 | 12   | 17    | 6     | 24   | 9    |         |                    |   |
|       |            |        |                    |      |       |       |      |      |         |                    |   |
| 15ft  | 8-10       | S5     | 19                 | 19   | 20    | 26    | 24   | 10   |         | Sand<br>~14.4 ft.  | S5 - Silty SAND with Gravel (SM), fine, 15-20% fines, ~15% fine gravel, light brown, wet  |
|       |            |        |                    |      |       |       |      |      |         |                    |   |
|       |            |        |                    |      |       |       |      |      |         |                    |   |
|       |            |        |                    |      |       |       |      |      |         |                    |   |
| 20ft  | 14-14.4    | S6     | 60/5               |      |       |       | 5    | 4    |         | Boulder<br>~16 ft. | S6 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine, trace medium, 5-10% fines, 10-15% fine gravel, light brown, wet           |
|       |            |        |                    |      |       |       |      |      |         |                    |   |
|       | 16-18      | S7     | 11                 | 10   | 15    | 16    | 24   | 10   |         |                    | S7 - Silty GRAVEL with Sand (GM), fine to coarse, angular, 35-40% fines, 25-30% fine to medium, trace coarse sand, light brown, wet   |
|       |            |        |                    |      |       |       |      |      |         |                    |   |
|       | 19-21      | S8     | 15                 | 14   | 19    | 29    | 24   | 16   |         | Sand               | S8 - Silty SAND (SM), fine, trace medium, 15-20% fines, ~5% fine gravel, light brown, wet   |
|       |            |        |                    |      |       |       |      |      |         |                    |   |
|       |            |        |                    |      |       |       |      |      |         |                    |   |
|       |            |        |                    |      |       |       |      |      |         |                    |   |
|       | 24-25.7    | S9     | 59                 | 51   | 40    | 80/2  | 20   | 13   |         |                    | S9 - Silty SAND (SM), fine, ~20% fines, ~5% fine gravel, gray, wet  |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Heavy drill chattering from 14.5 feet to 16 feet. Encountered possible boulder.
- Open hole drive and wash technique used at 19 feet.

|          |   |  |                        |
|----------|---|--|------------------------|
| Project: | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |  | LGCI Project No.: 1644 |

| Depth<br>Scale | Sample<br>Depth (ft) | Sample<br>No | Blows per 6 inches |      |       |       | Pen<br>(in) | Rec<br>(in) | Remarks | Strata  | Sample Description  |
|----------------|----------------------|--------------|--------------------|------|-------|-------|-------------|-------------|---------|---------|---|
|                |                      |              | 0-6                | 6-12 | 12-18 | 18-24 |             |             |         |         |   |
| 30 ft          |                      |              |                    |      |       |       |             |             |         | Sand    | S10 - Silty SAND (SM), fine, trace medium, 20-25% fines, trace fine gravel, gray, wet |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                | 29-31                | S10          | 39                 | 51   | 38    | 38    | 24          | 16          |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
| 35 ft          |                      |              |                    |      |       |       |             |             |         |         | S11 - Silty SAND (SM), fine, 20-25% fines, gray, wet                                  |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                | 34-36                | S11          | 22                 | 29   | 31    | 31    | 24          | 17          |         |         |   |
| 40 ft          |                      |              |                    |      |       |       |             |             |         |         | S12 - Similar to S11  |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                | 39-41                | S12          | 31                 | 31   | 32    | 31    | 24          | 15          |         |         |   |
| 45 ft          |                      |              |                    |      |       |       |             |             |         | ~41 ft. | Bottom of boring at 41 feet. Backfilled borehole with drill cuttings.                 |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
| 50 ft          |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |

Remarks:

|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/28/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/31/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: Eastern edge of existing school          |
| Ground Surface El: 778.9 feet (see remark 1)                                   | Total Depth: 46 feet                               |
| Groundwater Depth: ~9 ft. at end of drilling                                   | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4-inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata  | Sample Description   |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|---------|--|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |         |  |
| 5ft   | 0-2        | S1     | 1                  | 4    | 6     | 8     | 24   | 17   |         | Topsoil | S1 - Top 6": Silty SAND (SM), fine, 20-25% fines, trace fine gravel, trace organic fines, trace roots, dark brown, moist |
|       |            |        |                    |      |       |       |      |      |         | Fill    | Bot. 11": Silty SAND (SM), fine, ~15% fines, ~5% fine gravel, trace roots, brown, moist                                  |
|       | 2-4        | S2     | 9                  | 10   | 19    | 21    | 24   | 8    |         |         | S2 - Similar to Bot. 11" of S1, trace fine angular gravel  |
|       | 4-6        | S3     | 19                 | 13   | 17    | 24    | 24   | 11   |         |         | S3 - Silty SAND (SM), fine, ~25% fines, trace fine gravel, trace organic fines, brown, wet                               |
| 10ft  | 6-8        | S4     | 22                 | 32   | 32    | 27    | 24   | 14   |         | ~8 ft.  | S4 - Similar to S3, trace fine angular gravel  |
|       | 8-10       | S5     | 26                 | 40   | 38    | 44    | 24   | 11   |         |         | S5 - Silty SAND (SM), fine, ~15% fines, 5-10% fine gravel, light brown, wet  |
|       | 10-12      | S6     | 41                 | 33   | 39    | 34    | 24   | 0    |         |         | S6 - No Recovery   |
|       | 12-14      | S7     | 20                 | 23   | 21    | 28    | 24   | 13   |         |         | S7 - Silty SAND (SM), fine, trace medium, ~15% fines, light brown, wet   |
| 15ft  | 14-16      | S8     | 64                 | 27   | 26    | 33    | 24   | 11   | 2       |         | S8 - Silty SAND (SM), fine, trace medium, 20-25% fines, trace fine gravel, light brown, wet                              |
|       |            |        |                    |      |       |       |      |      |         |         |  |
|       |            |        |                    |      |       |       |      |      |         |         |  |
|       |            |        |                    |      |       |       |      |      |         |         |  |
| 20ft  | 19-21      | S9     | 13                 | 21   | 25    | 43    | 24   | 15   | 3       | Sand    | S9 - Silty SAND (SM), fine, trace medium, 20-25% fines, trace fine gravel, light brown, wet                              |
|       |            |        |                    |      |       |       |      |      |         |         |  |
|       |            |        |                    |      |       |       |      |      |         |         |  |
|       |            |        |                    |      |       |       |      |      |         |         |  |
|       | 24-26      | S10    | 21                 | 29   | 38    | 75    | 24   | 19   |         |         | S10 - Silty SAND (SM), fine, trace medium, 20-25% fines, trace fine gravel, light brown to gray, wet                     |

**Remarks:**

- Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," dated March 26, 2018 and provided to LGCI by Nitsch Engineering, Inc. via email on March 28, 2018.
- Open hole drive and wash technique used at 14 feet.
- Drill chattered from 18 feet to 19 feet. Encountered possible boulder.

|          |   |  |                        |
|----------|---|--|------------------------|
| Project: | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |  | LGCI Project No.: 1644 |

| Depth<br>Scale | Sample<br>Depth (ft) | Sample<br>No | Blows per 6 inches |      |       |       | Pen<br>(in) | Rec<br>(in) | Remarks | Strata  | Sample Description   |
|----------------|----------------------|--------------|--------------------|------|-------|-------|-------------|-------------|---------|---------|--|
|                |                      |              | 0-6                | 6-12 | 12-18 | 18-24 |             |             |         |         |  |
| 30 ft          |                      |              |                    |      |       |       |             |             | 4       | Sand    | S11 - No Recovery<br>S12 - Silty SAND (SM), fine, 20-25% fines, trace fine gravel, gray, wet |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
| 35 ft          | 29-29                | S11          | 120/0              |      |       |       | 0           | 0           |         |         |  |
|                | 30-32                | S12          | 32                 | 45   | 40    | 56    | 24          | 15          |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
| 40 ft          | 34-36                | S13          | 28                 | 50   | 49    | 64    | 24          | 22          |         |         | S13 - Silty SAND (SM), fine, ~20% fines, gray, wet   |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
| 45 ft          | 39-41                | S14          | 15                 | 38   | 47    | 35    | 24          | 15          |         |         | S14 - Silty SAND (SM), fine, trace medium, ~20% fines, trace fine gravel, gray, wet          |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
| 50 ft          | 44-46                | S15          | 13                 | 25   | 26    | 21    | 24          | 13          | 5       | ~46 ft. | S15 - Silty SAND (SM), fine, trace medium, ~20% fines, gray, wet                             |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         | Bottom of boring at 46 feet. Backfilled borehole with drill cuttings and 1 bag of sand.      |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |

**Remarks:**

- Drill chattered from 29 feet to 30 feet. Encountered possible boulder.
- Alternate location is offset ~10 feet south from original location. Alternate location is ~5 feet higher in elevation than the original location.

|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                         |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/22/2018                        |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/22/2018                      |
| LGCI Engineer: Tom Sinnott   | Location: Eastern edge of roadway SE of school |
| Ground Surface El: 774.8 feet (see remark 1)                                   | Total Depth: 27 feet                           |
| Groundwater Depth: ~21 ft. at end of drilling                                  | Drill Rig Type: Mobile B-48 Track Rig          |
|  | Drilling Method: HSA (3-1/4" ID)               |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"     |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                      |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata         | Sample Description   |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|----------------|--|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |                |  |
| 5ft   | 0.5-2      | S1     |                    | 6    | 7     | 5     | 18   | 12   |         | Asphalt        | Drilled through 2" of asphalt  |
|       |            |        |                    |      |       |       |      |      |         | Fill<br>~4 ft. | S1 - Silty SAND (SM), fine, ~20% fines, ~5% fine gravel, trace asphalt, brown, moist                       |
|       | 2-4        | S2     | 9                  | 11   | 19    | 53    | 24   | 15   |         |                | S2 - Silty SAND with Gravel (SM), fine, trace medium, 15-20% fines, ~15% fine angular gravel, brown, moist |
|       | 4-6        | S3     | 13                 | 23   | 28    | 28    | 24   | 14   |         |                | S3 - Silty SAND (SM), 15-20% fines, trace fine gravel, angular stone fragments, light brown, moist         |
| 10ft  | 6-8        | S4     | 21                 | 20   | 22    | 26    | 24   | 14   | 2       | Sand           | S4 - Similar to S3   |
|       |            |        |                    |      |       |       |      |      |         |                |  |
|       | 10-12      | S5     | 11                 | 14   | 15    | 16    | 24   | 19   |         |                | S5 - Silty SAND (SM), fine, trace medium, 20-25% fines, 5-10% fine gravel, light brown, moist              |
|       |            |        |                    |      |       |       |      |      |         |                |  |
| 15ft  | 15-17      | S6     | 18                 | 62   | 25    | 22    | 24   | 19   |         |                | S6 - Silty SAND (SM), fine, ~15% fines, trace fine gravel, angular stone fragments, light brown, moist     |
|       |            |        |                    |      |       |       |      |      |         |                |  |
|       |            |        |                    |      |       |       |      |      |         |                |  |
|       |            |        |                    |      |       |       |      |      |         |                |  |
| 20ft  | 20-22      | S7     | 6                  | 11   | 16    | 16    | 24   | 17   |         |                | S7 - Silty SAND (SM), fine, ~25% fines, light brown, moist   |
|       |            |        |                    |      |       |       |      |      |         |                |  |
|       |            |        |                    |      |       |       |      |      |         |                |  |
|       |            |        |                    |      |       |       |      |      |         |                |  |

**Remarks:**

- Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," dated March 26, 2018 and provided to LGCI by Nitsch Engineering, Inc. via email on March 28, 2018.
- Drill chattered at 13 feet.

|          |   |  |                        |
|----------|---|--|------------------------|
| Project: | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |  | LGCI Project No.: 1644 |

| Depth<br>Scale | Sample<br>Depth (ft) | Sample<br>No | Blows per 6 inches |      |       |       | Pen<br>(in) | Rec<br>(in) | Remarks | Strata                 | Sample Description   |
|----------------|----------------------|--------------|--------------------|------|-------|-------|-------------|-------------|---------|------------------------|--|
|                |                      |              | 0-6                | 6-12 | 12-18 | 18-24 |             |             |         |                        |  |
|                | 25-27                | S8           | 16                 | 60   | 37    | 27    | 24          | 12          |         | <b>Sand</b><br>~27 ft. | S8 - Silty SAND (SM), fine, 20-25% fines, trace angular fine gravel, light brown, wet                                  |
| 30 ft          |                      |              |                    |      |       |       |             |             |         |                        | Bottom of boring at 27 feet. Backfilled borehole with drill cuttings. Restored ground surface with asphalt cold patch. |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
| 35 ft          |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
| 40 ft          |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
| 45 ft          |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
| 50 ft          |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |
|                |                      |              |                    |      |       |       |             |             |         |                        |  |

Remarks:

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|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                         |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/22/2018                        |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/22/2018                      |
| LGCI Engineer: Tom Sinnott   | Location: Eastern edge of roadway SE of school |
| Ground Surface El: 775.8 feet (see remark 1)                                   | Total Depth: 22 feet                           |
| Groundwater Depth: ~18 ft. at end of drilling                                  | Drill Rig Type: Mobile B-48 Track Rig          |
|  | Drilling Method: HSA (3-1/4" ID)               |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"     |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                      |
| Drop: 30 inches  |  |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |      |       |       | Pen (in) | Rec (in) | Remarks | Strata         | Sample Description   |
|-------------|-------------------|-----------|--------------------|------|-------|-------|----------|----------|---------|----------------|--|
|             |                   |           | 0-6                | 6-12 | 12-18 | 18-24 |          |          |         |                |  |
| 5ft         | 0-2               | S1        | 1                  | 9    | 6     | 6     | 24       | 10       |         | Topsoil ~2 ft. | S1 - Silty SAND (SM), fine, 25-30% fines, trace fine angular gravel, trace organic fines, trace roots, trace leaves, dark brown, moist |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             | 2-4               | S2        | 4                  | 4    | 2     | 3     | 24       | 9        |         |                | S2 - Silty SAND (SM), ~20% fines, ~5% fine gravel, brown to gray, moist  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
| 10ft        | 4-6               | S3        | 2                  | 2    | 3     | 2     | 24       | 12       |         |                | S3 - Silty SAND (SM), fine, 20-25% fines, trace fine gravel, trace roots, brown, moist   |
|             |                   |           |                    |      |       |       |          |          |         |                | S4 - Similar to S3   |
|             | 6-8               | S4        | 1                  | 2    | 2     | 2     | 24       | 8        |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
| 15ft        | 8-10              | S5        | 1                  | 1    | 1     | 1     | 24       | 13       |         | Fill           | S5 - Silty SAND (SM), fine, ~25% fines, trace fine gravel, trace roots, trace organic fines, trace wood, brown, moist                  |
|             |                   |           |                    |      |       |       |          |          |         |                | S6 - Silty SAND (SM), fine, 20-25% fines, trace fine gravel, brown, wet  |
|             | 10-12             | S6        | 1                  | 1    | 4     | 9     | 24       | 6        |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                | S7 - Similar to S6, trace roots  |
| 20ft        | 12-14             | S7        | 4                  | 3    | 3     | 1     | 24       | 6        |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                | S8 - Similar to S6, trace organic fines  |
|             | 14-16             | S8        | WOH                | 1    | 4     | 5     | 24       | 8        |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             | 16-18             | S9        | 6                  | 7    | 10    | 8     | 24       | 11       |         |                | S9 - Silty SAND (SM), fine, 15-20% fines, light brown, wet   |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             | 20-22             | S10       | 3                  | 7    | 5     | 5     | 24       | 10       |         | Sand           | S10 - Silty SAND (SM), fine, ~15% fines, light brown, wet  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                |  |
|             |                   |           |                    |      |       |       |          |          |         |                | Bottom of boring at 22 feet. Backfilled borehole with drill cuttings and 1 bag of sand.  |

**Remarks:**

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," dated March 26, 2018 and provided to LGCI by Nitsch Engineering, Inc. via email on March 28, 2018.

|   |  |
|---|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b>  |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                          | LGCI Project No.: 1644                       |
| Drilling Subcontractor: Northern Drill Service, Inc.                            | Date Started: 2/23/2018                      |
| Drilling Foreman: Tim Tucker  | Date Completed: 2/23/2018                    |
| LGCI Engineer: Tom Sinnott  | Location: Island east of the existing school |
| Ground Surface El: 788.3 feet (see remark 1)                                    | Total Depth: 22 feet                         |
| Groundwater Depth: ~18.5 ft. at end of drilling<br>~18.7 ft. after installation | Drill Rig Type: Mobile B-48 Track Rig        |
|   | Drilling Method: HSA (3-1/4" ID)             |
| Hammer Weight: 140 lbs  | Split Spoon Diameter: ID - 1.375", OD - 2"   |
| Hammer Type: Automatic  | Rock Core Barrel Size: NA                    |
| Drop: 30 inches   |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata      | Sample Description   |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|-------------|--|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |             |  |
| 5ft   | 0-0.7      | S1     | 10                 | 60/2 |       |       | 8    | 2    | 2       | Topsoil     | S1 - Silty SAND (SM), fine, ~25% fines, trace organic fines, trace roots, trace angular fine gravel, dark brown, moist |
|       |            |        |                    |      |       |       |      |      |         | ~2.4 ft.    | S2 - Top 5": Similar to S1, no trace fine angular gravel   |
|       | 2-4        | S2     | 6                  | 17   | 15    | 14    | 24   | 19   |         | Fill ~4 ft. | Bot. 14": Silty SAND (SM), fine, ~15% fines, 5-10% fine angular gravel, light brown, moist                             |
| 10ft  | 4-6        | S3     | 11                 | 48   | 47    | 15    | 24   | 17   | 3       | Sand        | S3 - Silty SAND (SM), fine, 15-20% fines, ~5% fine gravel, angular stone fragments, light brown, moist                 |
|       | 6-8        | S4     | 14                 | 13   | 15    | 40    | 24   | 15   |         |             | S4 - Silty SAND (SM), fine, ~15% fines, light brown, moist   |
|       |            |        |                    |      |       |       |      |      |         |             |  |
| 15ft  | 10-12      | S5     | 17                 | 19   | 17    | 13    | 24   | 19   |         | Sand        | S5 - Silty SAND (SM), fine, ~15% fines, trace fine gravel, light brown, moist  |
|       |            |        |                    |      |       |       |      |      |         |             |  |
|       |            |        |                    |      |       |       |      |      |         |             |  |
| 20ft  | 15-17      | S6     | 9                  | 15   | 18    | 10    | 24   | 17   |         | Sand        | S6 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine, 10-15% fines, ~15% fine gravel, light brown, moist         |
|       |            |        |                    |      |       |       |      |      |         |             |  |
|       |            |        |                    |      |       |       |      |      |         |             |  |
|       | 20-22      | S7     | 5                  | 3    | 6     | 8     | 24   | 10   |         | ~22 ft.     | S7 - Silty SAND (SM), fine, ~15% fines, trace fine gravel, light brown, wet  |
|       |            |        |                    |      |       |       |      |      |         |             | Bottom of boring at 22 feet. Installed groundwater observation well.   |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Drill chattered at 8 feet.
- Auger refusal at 9 feet. Offset borehole 3 feet north.

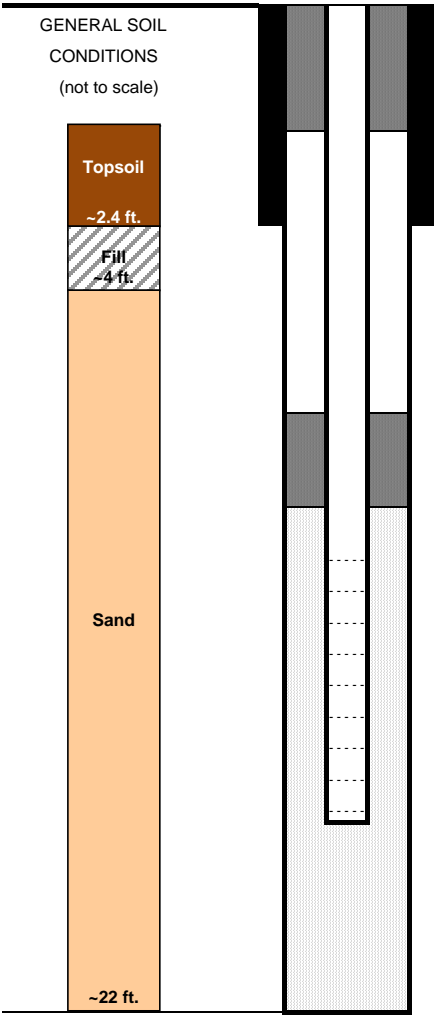


**GROUNDWATER OBSERVATION WELL  
INSTALLATION REPORT**

Boring No. : **B-123-OW**

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|   |                                  |                        |                                    |
|---|----------------------------------|------------------------|------------------------------------|
| Project Name: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                                  |                        |                                    |
| LGCI Project Number: <b>1644</b>  |                                  |                        |                                    |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                              |                                  |                        |                                    |
| Drilling Subcontractor:   | Northern Drill Service, Inc.     | Date Started:          | 2/23/2018                          |
| Drilling Foreman:   | Tim Tucker                       | Date Completed:        | 2/23/2018                          |
| LGCI Engineer:  | Tom Sinnott                      | Location:              | Island east of the existing school |
| Ground Surface Elevation:   | 788.3 feet (See remark 1)        | Total Depth of Boring: | 22 feet                            |
| Ground Water Depth:   | ~18.7 ft. at end of installation | Drill Rig Type:        | Mobile B-48 Track Rig              |
|   |                                  | Drilling Method:       | HSA (3-1/4" ID)                    |

|  |  |  |                         |
|--|--|--|-------------------------|
| <p>GENERAL SOIL CONDITIONS (not to scale)</p>  |  | Riser Stickup ~0' above ground surface   |                         |
|  |  | THICKNESS OF SURFACE SEAL                | 6 inch                  |
|  |  | TYPE OF SURFACE SEAL                     | Concrete                |
|  |  | TYPE OF SURFACE CASING                   | Aluminum road box       |
|  |  | ID OF SURFACE CASING                     | 6 inch                  |
|  |  | DEPTH TO BOTTOM OF CASING                | 1 foot                  |
|  |  | ID OF RISER PIPE                         | 2 inch                  |
|  |  | TYPE OF RISER PIPE                       | Schedule 40 PVC         |
|  |  | TYPE OF BACKFILL AROUND RISER PIPE       | Drill cuttings          |
|  |  | DEPTH TO TOP OF SEAL                     | 7 feet                  |
|  |  | TYPE OF SEAL                             | Bentonite chips         |
|  |  | DEPTH TO BOTTOM OF SEAL                  | 9 feet                  |
|  |  | DEPTH TO TOP OF PERVIOUS SECTION         | 10                      |
|  |  | TYPE OF PERVIOUS SECTION                 | Schedule 40 PVC         |
|  |  | DESCRIBE OPENINGS                        | 0.01 inch slots         |
|  |  | ID OF PERVIOUS SECTION                   | 2 inch                  |
|  |  | TYPE OF BACKFILL AROUND PERVIOUS SECTION | Holliston sand (3 bags) |
|  |  | DEPTH TO BOTTOM OF PERVIOUS SECTION      | 20 feet                 |
|  |  | DEPTH TO BOTTOM OF SAND COLUMN           | 22 feet                 |
|  |  | TYPE OF BACKFILL BELOW PERVIOUS SECTION  | Holliston sand          |
|  |  | DIAMETER OF BOREHOLE                     | 9 inch                  |
|  |  | DEPTH TO BOTTOM OF BOREHOLE              | 22 feet                 |

Remarks: 1. Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.

|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 3/1/2018                             |
| Drilling Foreman: Tim Tucker   | Date Completed: 3/1/2018                           |
| LGCI Engineer: Tom Sinnott   | Location: Southern edge of existing school         |
| Ground Surface El: 784.5 feet (see remark 1)                                   | Total Depth: 10.8 feet                             |
| Groundwater Depth: ~2.5 ft. at end of drilling                                 | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4 inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |      |       |       | Pen (in) | Rec (in) | Remarks | Strata  | Sample Description  |
|-------------|-------------------|-----------|--------------------|------|-------|-------|----------|----------|---------|---------|---|
|             |                   |           | 0-6                | 6-12 | 12-18 | 18-24 |          |          |         |         |   |
| 5ft         | 0-2               | S1        | 2                  | 13   | 17    | 15    | 24       | 22       |         | Topsoil | S1 - Top 7": Silty SAND (SM), fine, ~25% fines, trace organic fines, trace roots, dark brown, moist                                   |
|             |                   |           |                    |      |       |       |          |          |         |         | Bot. 15": Silty SAND with Gravel (SM), fine, ~15% fines, ~15% fine gravel, trace plastic, brown, moist                                |
|             | 2-4               | S2        | 18                 | 18   | 19    | 17    | 24       | 18       |         |         | S2 - Similar to Bot. 15" of S1  |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
| 10ft        | 4-6               | S3        | 21                 | 67   | 40    | 35    | 24       | 14       |         | Fill    | S3 - Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 40-45% fine to coarse angular gravel, brown, moist                    |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
|             | 6-7               | S4        | 56                 | 64   |       |       | 12       | 12       |         |         | S4 - Poorly Graded SAND with Silt (SP-SM), fine, 10-15% fines, ~15% fine angular gravel, angular stone fragments, brown, moist        |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
| 15ft        | 8-8.8             | S5        | 29                 | 60/3 |       |       | 9        | 4        |         |         |   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
|             | 10-10.8           | S6        | 55                 | 65/3 |       |       | 9        | 9        |         | Sand    | S5 - Silty SAND with Gravel (SM), fine, trace medium, ~15% fines, ~15% fine angular gravel, angular stone fragments, light brown, wet |
|             |                   |           |                    |      |       |       |          |          |         |         | S6 - Silty SAND (SM), fine, ~15% fines, trace fine angular gravel, light brown, wet   |
| 20ft        |                   |           |                    |      |       |       |          |          |         |         |   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |
|             |                   |           |                    |      |       |       |          |          |         |         |   |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.

|  |   |
|--|---|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |   |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                          |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/23/2018                         |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/23/2018                       |
| LGCI Engineer: Tom Sinnott   | Location: Southern edge of southern parking lot |
| Ground Surface El: 782.8 feet (see remark 1)                                   | Total Depth: 17 feet                            |
| Groundwater Depth: NE  | Drill Rig Type: Mobile B-48 Track Rig           |
|  | Drilling Method: HSA (3-1/4" ID)                |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"      |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                       |
| Drop: 30 inches  |   |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks         | Strata         | Sample Description   |
|-------|------------|--------|--------------------|------|-------|-------|------|------|-----------------|----------------|--|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |                 |                |  |
| 5ft   | 0-2        | S1     | 5                  | 6    | 5     | 7     | 24   | 13   |                 | Asphalt        | S1 - Top 4": Asphalt, trace plastic  |
|       |            |        |                    |      |       |       |      |      |                 | Fill<br>~4 ft. | Bot. 9": Silty SAND (SM), fine, 15-20% fines, ~5% angular gravel, brown, moist                                     |
|       | 2-4        | S2     | 9                  | 17   | 16    | 22    | 24   | 12   |                 |                | S2 - Silty SAND (SM), fine, ~30% fines, ~5% fine gravel, trace roots, trace organic fines, trace roots, brown, wet |
|       |            |        |                    |      |       |       |      |      |                 |                |  |
| 10ft  | 4-6        | S3     | 8                  | 13   | 17    | 17    | 24   | 21   | Sand<br>~17 ft. |                | S3 - Top 14": Poorly Graded SAND with Silt (SP-SM), fine, ~5% fines, 10-15% fine gravel, light brown, wet          |
|       |            |        |                    |      |       |       |      |      |                 |                | Bot. 7": Silty SAND (SM), fine, 25-30% fines, ~5% fine gravel, light brown to gray, moist                          |
|       | 6-8        | S4     | 15                 | 20   | 23    | 21    | 24   | 16   |                 |                | S4 - Silty SAND with Gravel (SM), fine, ~30% fines, ~15% fine gravel, angular stone fragments, gray, moist         |
|       |            |        |                    |      |       |       |      |      |                 |                |  |
| 15ft  |            |        |                    |      |       |       |      |      |                 |                |  |
|       | 10-12      | S5     | 8                  | 17   | 18    | 10    | 24   | 19   |                 |                | S5 - Silty SAND (SM), fine, trace medium, 25-30% fines, trace fine gravel, gray, moist                             |
|       |            |        |                    |      |       |       |      |      |                 |                |  |
|       |            |        |                    |      |       |       |      |      |                 |                |  |
| 20ft  |            |        |                    |      |       |       |      |      |                 |                |  |
|       | 15-17      | S6     | 10                 | 15   | 17    | 20    | 24   | 24   |                 |                | S6 - Similar to S5   |
|       |            |        |                    |      |       |       |      |      |                 |                |  |
|       |            |        |                    |      |       |       |      |      |                 |                |  |
|       |            |        |                    |      |       |       |      |      |                 |                | Bottom of boring at 17 feet. Backfilled borehole with drill cuttings.  |
|       |            |        |                    |      |       |       |      |      |                 |                |  |
|       |            |        |                    |      |       |       |      |      |                 |                |  |
|       |            |        |                    |      |       |       |      |      |                 |                |  |
|       |            |        |                    |      |       |       |      |      |                 |                |  |
|       |            |        |                    |      |       |       |      |      |                 |                |  |
|       |            |        |                    |      |       |       |      |      |                 |                |  |
|       |            |        |                    |      |       |       |      |      |                 |                |  |

**Remarks:**

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," dated March 26, 2018 and provided to LGCI by Nitsch Engineering, Inc. via email on March 28, 2018.

|  |                               |
|--|-------------------------------|
| <b>Project:</b> Proposed Worcester South High School, Worcester, Massachusetts |                               |
| <b>Client:</b> Lamoureux Pagano & Associates, Inc.                             | LGCI Project No.: 1644        |
| <b>Drilling Subcontractor:</b>   | <b>Date Started:</b>          |
| <b>Drilling Foreman:</b>   | <b>Date Completed:</b>        |
| <b>LGCI Engineer:</b>  | <b>Location:</b>              |
| <b>Ground Surface El:</b>  | <b>Total Depth:</b>           |
| <b>Groundwater Depth:</b>  | <b>Drill Rig Type:</b>        |
|  | <b>Drilling Method:</b>       |
| <b>Hammer Weight:</b>  | <b>Split Spoon Diameter:</b>  |
| <b>Hammer Type:</b>  | <b>Rock Core Barrel Size:</b> |
| <b>Drop:</b>   |                               |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata | Sample Description  |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|--------|---|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |        |   |
| 5ft   |            |        |                    |      |       |       |      |      |         |        | Boring B-126 was not performed due to difficult access along steep slope. |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
| 10ft  |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
| 15ft  |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
| 20ft  |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |

Remarks:

|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/15/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/16/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: Wooded area south of existing school     |
| Ground Surface El: 788.7 feet (see remark 1)                                   | Total Depth: 26 feet                               |
| Groundwater Depth: ~6.1 ft. at end of drilling                                 | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4 inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata | Sample Description  |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|--------|---|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |        |   |
| 5ft   | 0-2        | S1     | 2                  | 7    | 16    | 19    | 24   | 15   | 2       | Sand   | S1 - Silty SAND (SM), fine, trace medium, trace coarse, ~15% fines, light brown, moist      |
|       |            |        |                    |      |       |       |      |      |         |        | S2 - Similar to S1, trace fine angular gravel   |
|       | 2-4        | S2     | 18                 | 25   | 41    | 40    | 24   | 16   |         |        | S3 - Similar to S1, trace fine angular gravel   |
| 10ft  | 4-6        | S3     | 37                 | 33   | 40    | 44    | 24   | 15   |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
| 15ft  | 9-10.7     | S4     | 12                 | 23   | 67    | 60/2  | 20   | 13   |         |        | S4 - Silty SAND (SM), fine, 25-30% fines, trace fine gravel, light brown, wet               |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
| 20ft  | 14-16      | S5     | 24                 | 43   | 56    | 38    | 24   | 15   |         |        | S5 - Silty SAND (SM), fine, trace medium, 20-25% fines, trace fine gravel, light brown, wet |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       | 19-20.8    | S6     | 14                 | 26   | 25    | 75/4  | 22   | 14   |         |        | S6 - Silty SAND (SM), fine, ~40% fines, gray, wet   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       |            |        |                    |      |       |       |      |      |         |        |   |
|       | 24-26      | S7     | 11                 | 16   | 18    | 17    | 24   | 17   |         |        | S7 - Similar to S6, ~30% fines  |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Open hole drive and wash technique used at 8.5 feet.

|          |   |  |                        |
|----------|---|--|------------------------|
| Project: | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |  | LGCI Project No.: 1644 |

| Depth<br>Scale | Sample<br>Depth (ft) | Sample<br>No | Blows per 6 inches |      |       |       | Pen<br>(in) | Rec<br>(in) | Remarks | Strata          | Sample Description  |
|----------------|----------------------|--------------|--------------------|------|-------|-------|-------------|-------------|---------|-----------------|---|
|                |                      |              | 0-6                | 6-12 | 12-18 | 18-24 |             |             |         |                 |   |
| 30 ft          |                      |              |                    |      |       |       |             |             |         | Sand<br>~26 ft. |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 | Bottom of boring at 26 feet. Backfilled borehole with drill cuttings. |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
| 35 ft          |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
| 40 ft          |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
| 45 ft          |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
| 50 ft          |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |
|                |                      |              |                    |      |       |       |             |             |         |                 |   |

Remarks:

|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b>         |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                                 | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                                   | Date Started: 2/15/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/15/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: Wooded area south of existing school     |
| Ground Surface El: 790.5 feet (See remark 1)   | Total Depth: 31 feet                               |
| Groundwater Depth: ~13.1 ft. at end of drilling<br>~9.4 ft. 2 hours after installation | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4 inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata  | Sample Description  |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|---------|---|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |         |   |
| 5ft   | 0-2        | S1     | WOH                | 4    | 5     | 8     | 24   | 13   |         | Topsoil | S1 - Silty SAND (SM), fine, 20-25% fines, trace organic fines, trace roots, dark brown, moist   |
|       | 2-4        | S2     | 16                 | 12   | 8     | 10    | 24   | 6    |         |         | S2 - Similar to S1, 5-10% fine gravel, trace fine angular gravel  |
|       | 4-6        | S3     | 9                  | 14   | 22    | 11    | 24   | 4    |         | Subsoil | S3 - Poorly Graded Gravel (GP), coarse, 0-5% fines, 10-15% fine to coarse sand, brown to orange, moist  |
|       | 6-8        | S4     | 8                  | 33   | 11    | 14    | 24   | 10   |         |         | S4 - Top 6": Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 15-20% fine gravel, trace roots, angular stone fragments, dark brown, moist |
| 10ft  | 8-10       | S5     | 19                 | 22   | 24    | 31    | 24   | 14   |         | Sand    | Bot. 4": Silty SAND (SM), fine, trace medium, ~20% fines, brown, moist  |
|       | 10-12      | S6     | 27                 | 29   | 33    | 29    | 24   | 13   |         |         | S5 - Silty SAND (SM), fine, ~25% fines, light brown, wet  |
|       |            |        |                    |      |       |       |      |      |         |         | S6 - Similar to S5, trace fine angular gravel   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
| 15ft  | 14-16      | S7     | 20                 | 23   | 30    | 30    | 24   | 12   | 2       |         | S7 - Similar to S6  |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
| 20ft  | 19-19.3    | S8     | 100/4              |      |       |       | 4    | 4    | 3       |         | S8 - Well Graded SAND (SW), fine to coarse, 0-5% fines, 10-15% fine gravel, light brown to gray, wet  |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         | Boulder |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       |            |        |                    |      |       |       |      |      |         | Sand    |   |
|       |            |        |                    |      |       |       |      |      |         |         |   |
|       | 24-26      | S9     | 33                 | 54   | 27    | 36    | 24   | 16   |         |         | S9 - Silty SAND (SM), fine, trace medium to coarse, 25-30% fines, trace fine gravel, light brown, wet   |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Drill chattered at 16 feet.
- Open hole drive and wash techniques used at 18 feet.

|          |   |  |                        |
|----------|---|--|------------------------|
| Project: | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |  | LGCI Project No.: 1644 |

| Depth<br>Scale | Sample<br>Depth (ft) | Sample<br>No | Blows per 6 inches |      |       |       | Pen<br>(in) | Rec<br>(in) | Remarks | Strata  | Sample Description   |
|----------------|----------------------|--------------|--------------------|------|-------|-------|-------------|-------------|---------|---------|--|
|                |                      |              | 0-6                | 6-12 | 12-18 | 18-24 |             |             |         |         |  |
| 30 ft          |                      |              |                    |      |       |       |             |             |         | Sand    | S10 - Silty SAND (SM), fine, trace medium, 25-30% fines, gray, wet   |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                | 29-31                | S10          | 22                 | 28   | 38    | 33    | 24          | 24          |         |         |  |
| 35 ft          |                      |              |                    |      |       |       |             |             |         | ~31 ft. | Bottom of boring at 31 feet. Installed groundwater observation well. |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
| 40 ft          |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
| 45 ft          |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
| 50 ft          |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |
|                |                      |              |                    |      |       |       |             |             |         |         |  |

Remarks:

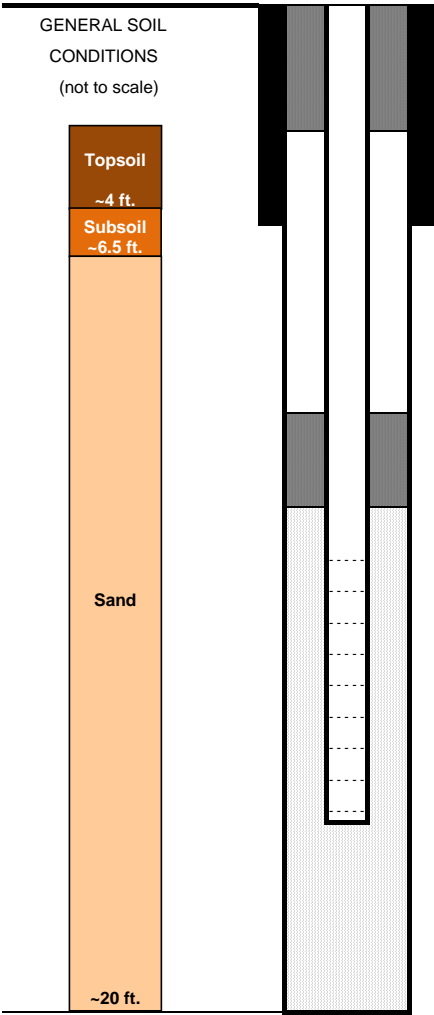


# GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

 Boring No. : **B-128-OW**

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|                           |   |                        |                                      |
|---------------------------|---|------------------------|--------------------------------------|
| Project Name:             | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                        |                                      |
| LGCI Project Number:      | <b>1644</b>   |                        |                                      |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                        |                                      |
| Drilling Subcontractor:   | Northern Drill Service, Inc.  | Date Started:          | 2/15/2018                            |
| Drilling Foreman:         | Tim Tucker  | Date Completed:        | 2/15/2018                            |
| LGCI Engineer:            | Tom Sinnott   | Location:              | Wooded area south of existing school |
| Ground Surface Elevation: | 790.5 feet (See remark 1)   | Total Depth of Boring: | 31 feet                              |
| Ground Water Depth:       | ~9.3 ft. at end of installation                                       | Drill Rig Type:        | Mobile B-48 Track Rig                |
|                           | ~9.4 ft. 2 hours after installation                                   | Drilling Method:       | Drive and wash with 4 inch casing    |

|  |  |  |                               |
|--|--|--|-------------------------------|
| <p>GENERAL SOIL CONDITIONS (not to scale)</p>  |  | Riser Stickup ~0' above ground surface |                               |
|  | THICKNESS OF SURFACE SEAL                |  | 6 inch                        |
|  | TYPE OF SURFACE SEAL                     |  | Concrete                      |
|  | TYPE OF SURFACE CASING                   |  | Aluminum road box             |
|  | ID OF SURFACE CASING                     |  | 6 inch                        |
|  | DEPTH TO BOTTOM OF CASING                |  | 1 foot                        |
|  | ID OF RISER PIPE                         |  | 2 inch                        |
|  | TYPE OF RISER PIPE                       |  | Schedule 40 PVC               |
|  | TYPE OF BACKFILL AROUND RISER PIPE       |  | Drill cuttings/Holliston Sand |
|  | DEPTH TO TOP OF SEAL                     |  | 18 feet                       |
|  | TYPE OF SEAL                             |  | Bentonite chips               |
|  | DEPTH TO BOTTOM OF SEAL                  |  | 20 feet                       |
|  | DEPTH TO TOP OF PERVIOUS SECTION         |  | 20 feet                       |
|  | TYPE OF PERVIOUS SECTION                 |  | Schedule 40 PVC               |
|  | DESCRIBE OPENINGS                        |  | 0.01 inch slots               |
|  | ID OF PERVIOUS SECTION                   |  | 2 inch                        |
|  | TYPE OF BACKFILL AROUND PERVIOUS SECTION |  | Holliston sand                |
|  | DEPTH TO BOTTOM OF PERVIOUS SECTION      |  | 30 feet                       |
|  | DEPTH TO BOTTOM OF SAND COLUMN           |  | 31 feet                       |
|  | TYPE OF BACKFILL BELOW PERVIOUS SECTION  |  | Holliston sand                |
|  | DIAMETER OF BOREHOLE                     |  | 8 inch                        |
|  | DEPTH TO BOTTOM OF BOREHOLE              |  | 32 feet                       |

Remarks: 1. Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.

|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/16/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/16/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: Western edge of southern wooded area     |
| Ground Surface El: 784.2 feet (see remark 1)                                   | Total Depth: 31 feet                               |
| Groundwater Depth: ~8 ft. at end of drilling                                   | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4 inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth Scale | Sample Depth (ft) | Sample No | Blows per 6 inches |      |       |       | Pen (in) | Rec (in) | Remarks | Strata             | Sample Description   |
|-------------|-------------------|-----------|--------------------|------|-------|-------|----------|----------|---------|--------------------|--|
|             |                   |           | 0-6                | 6-12 | 12-18 | 18-24 |          |          |         |                    |  |
| 5ft         | 0-2               | S1        | 4                  | 4    | 7     | 5     | 24       | 24       |         | Topsoil<br>~2 ft.  | S1 - Silty SAND (SM), fine, ~25% fines, trace organic fines, trace roots, dark brown, moist                          |
|             | 2-4               | S2        | 11                 | 7    | 4     | 5     | 24       | 10       |         | Subsoil<br>~8 ft.  | S2 - Silty SAND (SM), fine, ~20% fines, trace organic fines, brown, moist  |
|             | 4-6               | S3        | 4                  | 9    | 7     | 5     | 24       | 7        |         |                    | S3 - Silty SAND (SM), fine, trace medium, ~30% fines, trace organic fines, trace roots, brown, wet                   |
|             | 6-8               | S4        | 5                  | 6    | 11    | 24    | 24       | 5        |         |                    | S4 - Similar to S3, trace fine angular gravel  |
| 10ft        | 8-10              | S5        | 26                 | 73   | 26    | 19    | 24       | 12       |         | Sand<br>~20 ft.    | S5 - Silty SAND (SM), fine, trace medium, 15-20% fines, 5-10% fine gravel, angular stone fragments, light brown, wet |
|             | 10-12             | S6        | 25                 | 25   | 29    | 34    | 24       | 14       |         |                    | S6 - Similar to S5   |
|             |                   |           |                    |      |       |       |          |          |         |                    |  |
|             |                   |           |                    |      |       |       |          |          |         |                    |  |
| 15ft        | 14-16             | S7        | 60                 | 39   | 32    | 34    | 24       | 15       |         | Boulder<br>~23 ft. | S7 - Silty SAND with Gravel (SM), fine, 15-20% fines, ~15% fine gravel, light brown, wet                             |
|             |                   |           |                    |      |       |       |          |          |         |                    |  |
|             |                   |           |                    |      |       |       |          |          |         |                    |  |
|             |                   |           |                    |      |       |       |          |          |         |                    |  |
| 20ft        | 19-21             | S8        | 17                 | 22   | 18    | 22    | 24       | 12       |         | Sand               | S8 - Silty SAND (SM), fine, ~15% fines, ~5% fine gravel, angular stone fragments, light brown, wet                   |
|             |                   |           |                    |      |       |       |          |          |         |                    |  |
|             |                   |           |                    |      |       |       |          |          |         |                    |  |
|             |                   |           |                    |      |       |       |          |          |         |                    |  |
|             | 24-26             | S9        | 15                 | 18   | 25    | 34    | 24       | 17       |         | Sand               | S9 - Silty SAND (SM), fine, ~35% fines, trace fine gravel, gray, wet   |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Drill chattered at 18 feet.
- Open hole drive and wash technique used at 19 feet.

|          |   |  |                        |
|----------|---|--|------------------------|
| Project: | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |  | LGCI Project No.: 1644 |

| Depth<br>Scale | Sample<br>Depth (ft) | Sample<br>No | Blows per 6 inches |      |       |       | Pen<br>(in) | Rec<br>(in) | Remarks | Strata  | Sample Description  |
|----------------|----------------------|--------------|--------------------|------|-------|-------|-------------|-------------|---------|---------|---|
|                |                      |              | 0-6                | 6-12 | 12-18 | 18-24 |             |             |         |         |   |
| 30 ft          |                      |              |                    |      |       |       |             |             |         | Sand    | S10 - Similar to S9   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                | 29-31                | S10          | 10                 | 13   | 48    | 24    | 24          | 15          |         |         |   |
| 35 ft          |                      |              |                    |      |       |       |             |             |         | ~31 ft. | Bottom of boring at 31 feet. Backfilled borehole with drill cuttings. |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
| 40 ft          |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
| 45 ft          |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
| 50 ft          |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |
|                |                      |              |                    |      |       |       |             |             |         |         |   |

Remarks:

|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/16/2018                            |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/16/2018                          |
| LGCI Engineer: Tom Sinnott   | Location: SW corner of playing field               |
| Ground Surface El: 768.5 feet (see remark 1)                                   | Total Depth: 30.8 feet                             |
| Groundwater Depth: ~7.2 ft. at end of drilling                                 | Drill Rig Type: Mobile B-48 Track Rig              |
|  | Drilling Method: Drive and wash with 4 inch casing |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2"         |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                          |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata            | Sample Description  |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|-------------------|---|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |                   |   |
| 5ft   | 0-2        | S1     | 5                  | 1    | 3     | 7     | 24   | 14   |         | Topsoil           | S1 - Top 11": Silty SAND (SM), fine, 20-25% fines, trace fine gravel, trace organic fines, trace roots, dark brown, moist   |
|       |            |        |                    |      |       |       |      |      |         | Subsoil<br>~4 ft. | Bot. 3": Silty SAND (SM), fine, trace medium, 15-20% fines, trace fine gravel, brown, moist                                 |
|       | 2-4        | S2     | 8                  | 8    | 7     | 13    | 24   | 16   |         |                   | S2 - Silty SAND (SM), fine, trace medium, 15-20% fines, trace fine gravel, angular stone fragments, brown, moist            |
|       | 4-6        | S3     | 9                  | 13   | 12    | 24    | 24   | 15   |         |                   | S3 - Silty SAND (SM), fine, 20-25% fines, light brown, wet  |
| 10ft  | 6-8        | S4     | 22                 | 13   | 10    | 10    | 24   | 8    |         | Sand              | S4 - Similar to S3, trace fine gravel   |
|       |            |        |                    |      |       |       |      |      |         |                   |   |
|       | 9-11       | S5     | 7                  | 6    | 8     | 16    | 24   | 11   |         |                   | S5 - Poorly Graded SAND with Silt (SP-SM), fine, trace medium, 10-15% fines, trace fine subangular gravel, light brown, wet |
|       |            |        |                    |      |       |       |      |      |         |                   |   |
| 15ft  | 14-14.3    | S6     | 60/3               |      |       |       | 3    | 2    |         |                   | S6 - Silty SAND (SM), fine, trace medium, trace coarse, ~25% fines, 10-15% fine gravel, light brown, wet                    |
|       |            |        |                    |      |       |       |      |      |         |                   |   |
|       |            |        |                    |      |       |       |      |      |         |                   |   |
|       |            |        |                    |      |       |       |      |      |         |                   |   |
| 20ft  | 19-21      | S7     | 19                 | 24   | 34    | 33    | 24   | 20   |         |                   | S7 - Silty SAND (SM), fine, trace medium, ~25% fines, light brown, wet  |
|       |            |        |                    |      |       |       |      |      |         |                   |   |
|       |            |        |                    |      |       |       |      |      |         |                   |   |
|       | 24-26      | S8     | 21                 | 33   | 36    | 53    | 24   | 24   |         |                   | S8 - Similar to S7, trace fine gravel   |

**Remarks:**

- Ground surface elevations provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," provided to LGCI by Nitsch Engineering, Inc. via email on February 12, 2018.
- Open hole drive and wash technique used at 14 feet.
- Drill chattered at 14.3 feet to 17 feet. Encountered possible boulder.

|          |   |  |                        |
|----------|---|--|------------------------|
| Project: | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |  | LGCI Project No.: 1644 |

| Depth<br>Scale | Sample<br>Depth (ft) | Sample<br>No | Blows per 6 inches |      |       |       | Pen<br>(in) | Rec<br>(in) | Remarks | Strata    | Sample Description  |
|----------------|----------------------|--------------|--------------------|------|-------|-------|-------------|-------------|---------|-----------|---|
|                |                      |              | 0-6                | 6-12 | 12-18 | 18-24 |             |             |         |           |   |
| 30 ft          |                      |              |                    |      |       |       |             |             |         | Sand      | S9 - Silty SAND (SM), fine, trace medium, trace coarse, 20-25% fines, trace fine gravel, light brown, wet |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                | 29-30.8              | S9           | 20                 | 100  | 70    | 60/4  | 20          | 19          |         |           |   |
| 35 ft          |                      |              |                    |      |       |       |             |             |         | ~30.8 ft. | Bottom of boring at 30.8 feet. Backfilled borehole with drill cuttings.                                   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
| 40 ft          |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
| 45 ft          |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
| 50 ft          |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |
|                |                      |              |                    |      |       |       |             |             |         |           |   |

Remarks:

|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                     |
| Drilling Subcontractor: Northern Drill Service, Inc.                           | Date Started: 2/21/2018                    |
| Drilling Foreman: Tim Tucker   | Date Completed: 2/21/2018                  |
| LGCI Engineer: Tom Sinnott   | Location: NE corner of lower parking lot   |
| Ground Surface El: 749.4 feet (see remark 1)                                   | Total Depth: 27.4 feet                     |
| Groundwater Depth: ~25.1 ft. at end of drilling                                | Drill Rig Type: Mobile B-48 Track Rig      |
|  | Drilling Method: HSA (3-1/4" ID)           |
| Hammer Weight: 140 lbs   | Split Spoon Diameter: ID - 1.375", OD - 2" |
| Hammer Type: Automatic   | Rock Core Barrel Size: NA                  |
| Drop: 30 inches  |  |

| Depth | Sample     | Sample | Blows per 6 inches |      |       |       | Pen  | Rec  | Remarks | Strata         | Sample Description  |
|-------|------------|--------|--------------------|------|-------|-------|------|------|---------|----------------|---|
| Scale | Depth (ft) | No     | 0-6                | 6-12 | 12-18 | 18-24 | (in) | (in) |         |                |   |
| 5ft   | 0.5-2      | S1     |                    | 8    | 5     | 4     | 18   | 6    |         | <b>Asphalt</b> | Drilled through 6" of asphalt   |
|       |            |        |                    |      |       |       |      |      |         |                | S1 - Poorly Graded SAND with Gravel (SP) fine, trace medium 0-5% fines, ~15% fine gravel, trace asphalt, brown, moist |
|       | 2-4        | S2     | 3                  | 3    | 2     | 1     | 24   | 1    |         |                | S2 - Similar to S1  |
|       | 4-6        | S3     | 1                  | 10   | 4     | 2     | 24   | 8    |         |                | S3 - SILT (ML), slightly plastic, 10-15% fine sand, trace peat, trace roots, dark brown, moist                        |
| 10ft  | 6-8        | S4     | 3                  | 6    | 3     | 7     | 24   | 10   |         | <b>Fill</b>    | S4 - Silty SAND (SM), fine, 25-30% fines, 5-10% fine gravel, trace organic fines, trace roots, dark brown, moist      |
|       | 8-10       | S5     | 1                  | 1    | 2     | 2     | 24   | 6    |         |                | S5 - Similar to S4  |
|       | 10-12      | S6     | 1                  | 1    | 9     | 11    | 24   | 15   |         |                | S6 - Top 9" : Similar to S4   |
|       | 12-14      | S7     | 12                 | 17   | 20    | 31    | 24   | 15   |         | <b>~12 ft</b>  | Bot. 6": Silty SAND (SM), fine, ~15% fines, trace fine gravel, gray, moist  |
| 15ft  |            |        |                    |      |       |       |      |      |         |                | S7 - Silty SAND (SM), fine, 15-20% fines, trace fine gravel, light brown, moist                                       |
|       | 15-17      | S8     | 36                 | 37   | 39    | 30    | 24   | 20   |         |                | S8 - Similar to S7, trace fine angular gravel   |
|       |            |        |                    |      |       |       |      |      |         |                |   |
|       |            |        |                    |      |       |       |      |      |         |                |   |
| 20ft  | 20-22      | S9     | 23                 | 27   | 17    | 13    | 24   | 16   |         | <b>Sand</b>    | S9 - Similar to S7  |
|       |            |        |                    |      |       |       |      |      |         |                |   |
|       |            |        |                    |      |       |       |      |      |         |                |   |
|       |            |        |                    |      |       |       |      |      |         |                |   |

**Remarks:**

- Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," dated March 26, 2018 and provided to LGCI by Nitsch Engineering, Inc. via email on March 28, 2018.

|          |   |  |                        |
|----------|---|--|------------------------|
| Project: | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |  | LGCI Project No.: 1644 |

| Depth<br>Scale | Sample<br>Depth (ft) | Sample<br>No | Blows per 6 inches |      |       |       | Pen<br>(in) | Rec<br>(in) | Remarks | Strata            | Sample Description   |
|----------------|----------------------|--------------|--------------------|------|-------|-------|-------------|-------------|---------|-------------------|--|
|                |                      |              | 0-6                | 6-12 | 12-18 | 18-24 |             |             |         |                   |  |
|                | 25-27                | S10          | 19                 | 29   | 34    | 32    | 24          | 16          |         | Sand<br>~27.4 ft. | S10 - Similar to S7  |
|                | 27-27.4              | S11          | 120/5              |      |       |       | 5           | 4           |         |                   | S11 - Silty SAND (SM), fine, trace medium, ~25% fines, light brown, wet  |
| 30 ft          |                      |              |                    |      |       |       |             |             |         |                   | Bottom of boring at 27.4 feet. Backfilled borehole with drill cuttings. Restored ground surface with asphalt cold patch. |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
| 35 ft          |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
| 40 ft          |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
| 45 ft          |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
| 50 ft          |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |
|                |                      |              |                    |      |       |       |             |             |         |                   |  |

Remarks:

## **APPENDIX C - Logs of LGCI's Test Pits**



|   |   |
|---|---|
| Project: <b>Proposed Worcester South High School, Worcester, MA</b> |   |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>              | LGCI Project No.: 1644                      |
| Excavation Subcontractor: Northern Drill Service                    | Date Started: 08/15/17                      |
| Excavation Foreman: Dave Edilberti                                  | Date Completed: 08/15/17                    |
| LGCI Engineer: Hadi Kazemiroodsari                                  | Location: Western side of lower parking lot |
| Ground Surface El: 746.5' (see Remark 1)                            | Total Depth: 8'                             |
| Groundwater Depth: NE   | Excavator Type: Komatsu PC-120              |
|   | Test Pit Dimensions: 2'11" x 8'             |

| Depth Scale | Exc. Effort | Strata                        | Soil Description  |
|-------------|-------------|-------------------------------|---|
| 5 ft        | E           | Topsoil<br>~1'                | 0"-1': Silty SAND (SM), fine, ~30% fines, trace of gravel, trace of organics, roots, dark brown, moist            |
|             | E           | Silty Sand with Gravel<br>~8' | 1'-8': Silty SAND with Gravel (SM), fine to medium, ~15% fines, 20-25% gravel, light brown, moist<br>See remark 2 |
|             | M           |                               |   |
|             | M           |                               | Encountered boulder of ~2' diameter at depth of 4.5'  |
|             | M           |                               |   |
|             | M           |                               |   |
|             | M           |                               |   |
|             | M           |                               |   |
| 10 ft       |             |                               | Bottom of test pit at 8'. Backfilled with excavated material in 2' lifts and compacted with excavator bucket.     |
|             |             |                               |   |
|             |             |                               |   |
|             |             |                               |   |
|             |             |                               |   |
|             |             |                               |   |
|             |             |                               |   |
|             |             |                               |   |
| 15 ft       |             |                               |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.
- Encountered cobbles between 8" and 1' in diameter from 1' to 8'.
- Encountered fabric and crushed stone possibly indicating drainage line. Moved test pit 2' west and 2' north.

|   |  |
|---|--|
| Project: <b>Proposed Worcester South High School, Worcester, MA</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>              | LGCI Project No.: 1644                       |
| Excavation Subcontractor: Northern Drill Service                    | Date Started: 08/15/17                       |
| Excavation Foreman: Dave Edilberti                                  | Date Completed: 08/15/17                     |
| LGCI Engineer: Hadi Kazemiroodsari                                  | Location: Northern side of lower parking lot |
| Ground Surface El: 752' (see remark 1)                              | Total Depth: 13'                             |
| Groundwater Depth: NE   | Excavator Type: Komatsu PC-120               |
|   | Test Pit Dimensions: 4' x 10'                |

| Depth Scale | Exc. Effort | Strata                         | Soil Description  |
|-------------|-------------|--------------------------------|---|
| 5 ft        | M           | Topsoil<br>~11"                | 0" - 11": Silty SAND (SM), fine, ~30% fines, trace of gravel, organics, roots, dark brown, moist  |
|             | M           | Fill<br>~3'3"                  | 11" - 3.3': Poorly graded SAND with Silt and Gravel (SP-SM), fine to medium, trace coarse, ~10% fines, ~20% fine gravel, trace of asphalt, light brown, moist |
|             | M           |                                |   |
|             | M           |                                |   |
|             | M           | Silty Sand with Gravel<br>~13' | 3.3' - 13': Silty SAND with Gravel (SM), fine to medium, ~20% fines, 15-20% fine gravel, light brown, moist   |
|             | D           |                                |   |
|             | D           |                                |   |
|             | D           |                                |   |
|             | D           |                                |   |
|             | D           |                                |   |
|             | D           |                                |   |
|             | D           |                                |   |
|             |             |                                |   |
|             |             |                                |   |
|             |             |                                |   |
|             |             |                                |   |
| 15 ft       |             |                                | Bottom of test pit at 13'. Backfilled with excavated material in 2' lifts and compacted with excavator bucket.  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.
- Sloped location. North side of the test pit is at a higher elevation. Samples were taken on the northern side of the test pit.
- Natural soil encountered at a depth of 1.5' on the southern side of the test pit.

|                           |  |                      |                        |
|---------------------------|--|----------------------|------------------------|
| Project:                  | <b>Proposed Worcester South High School, Worcester, MA</b> |                      |                        |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>             |                      | LGCI Project No.: 1644 |
| Excavation Subcontractor: | Northern Drill Service                                     | Date Started:        | 08/15/17               |
| Excavation Foreman:       | Dave Edilberti   | Date Completed:      | 08/15/17               |
| LGCI Engineer:            | Hadi Kazemiroodsari  | Location:            | South of track         |
| Ground Surface El:        | 763.5' (see remark 1)                                      | Total Depth:         | 9'                     |
| Groundwater Depth:        | 9'   | Excavator Type:      | Komatsu PC-120         |
|                           |  | Test Pit Dimensions: | 4' x 10'               |

| Depth<br>Scale | Exc.<br>Effort | Strata                       | Soil Description  |
|----------------|----------------|------------------------------|---|
| 5 ft           | M              | Topsoil<br>~10"              | 0" - 10": Silty SAND (SM), fine, ~30% fines, trace gravel, organics, grass, roots, dark brown, moist                                    |
|                | M              | Fill                         | 10" - 3.2': Silty SAND with Gravel (SM), fine to medium, ~20% fines, ~20% fine gravel, trace organics, light brown to dark brown, moist |
|                | M              |                              | See remark 2  |
|                | M              |                              |   |
|                | M              | Silty<br>Sand with<br>Gravel | 3.2' - 9': Silty SAND with Gravel (SM), fine to medium, trace coarse, 15-20% fines, ~20% fine gravel, light brown, moist                |
|                | M              |                              |   |
|                | M              |                              |   |
|                | M              |                              |   |
|                | M              |                              |   |
| 10 ft          | M              | ~9'                          | Refusal at ~9'  |
|                |                |                              | Bottom of test pit at 9'. Backfilled with excavated material in 2' lifts and compacted with excavator bucket.                           |
|                |                |                              |   |
|                |                |                              |   |
|                |                |                              |   |
|                |                |                              |   |
| 15 ft          |                |                              |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.
- Encountered cobbles and boulders (5-10%) up to 2' in diameter from 1' to 3'.

|                           |  |                      |                             |
|---------------------------|--|----------------------|-----------------------------|
| Project:                  | <b>Proposed Worcester South High School, Worcester, MA</b> |                      |                             |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>             |                      | LGCI Project No.: 1644      |
| Excavation Subcontractor: | Northern Drill Service                                     | Date Started:        | 08/15/17                    |
| Excavation Foreman:       | Dave Edilberti   | Date Completed:      | 08/15/17                    |
| LGCI Engineer:            | Hadi Kazemiroodsari  | Location:            | Wooded area, south of track |
| Ground Surface El:        | 763' (see remark 1)  | Total Depth:         | 12.5'                       |
| Groundwater Depth:        | NE   | Excavator Type:      | Komatsu PC-120              |
|                           |  | Test Pit Dimensions: | 3'4" x 8.5'                 |

| Depth<br>Scale | Exc.<br>Effort | Strata                       | Soil Description   |
|----------------|----------------|------------------------------|--|
| 5 ft           | M              | Topsoil                      | 0"- 1.3': Silty SAND (SM), fine, ~30% fines, trace organics, roots, dark brown, moist                            |
|                | M              | ~1.3'                        |  |
|                | M              | Subsoil                      | 1.3' - 2.5': Silty SAND with Gravel (SM), fine, trace coarse, ~25% fines, ~25% fine gravel, light brown, moist   |
|                | M              | ~2.5'                        |  |
|                | M              | Silty<br>Sand with<br>Gravel | 2.5'- 12.5': Silty SAND with Gravel (SM), fine to medium, ~15% fines, ~25% fine gravel, light brown, moist       |
|                | M              |                              |  |
|                | M              |                              |  |
|                | M              |                              |  |
|                | M              |                              |  |
|                | M              |                              |  |
|                | M              |                              |  |
|                | M              |                              |  |
| 10 ft          | M              |                              |  |
|                | M              |                              |  |
|                | M              |                              |  |
|                | M              |                              |  |
| 15 ft          |                | ~12.5'                       | Bottom of test pit at 12.5'. Backfilled with excavated material in 2' lifts and compacted with excavator bucket. |
|                |                |                              |  |
|                |                |                              |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.

|                           |  |                      |                        |
|---------------------------|--|----------------------|------------------------|
| Project:                  | <b>Proposed Worcester South High School, Worcester, MA</b> |                      |                        |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>             |                      | LGCI Project No.: 1644 |
| Excavation Subcontractor: | Northern Drill Service                                     | Date Started:        | 08/14/17               |
| Excavation Foreman:       | Dave Edilberti   | Date Completed:      | 08/14/17               |
| LGCI Engineer:            | Hadi Kazemiroodsari  | Location:            | Southern side of track |
| Ground Surface El:        | 766' (see remark 1)  | Total Depth:         | 9.5'                   |
| Groundwater Depth:        | NE   | Excavator Type:      | Komatsu PC-120         |
|                           |  | Test Pit Dimensions: | 3.5' x 10.5'           |

| Depth<br>Scale | Exc.<br>Effort | Strata              | Soil Description   |
|----------------|----------------|---------------------|--|
| 5 ft           | M              | Topsoil<br>~11"     | 0"- 11": Silty SAND (SM), fine, ~35% fines, trace fine gravel, organics, roots, dark brown, moist                |
|                | M              | Subsoil<br>~2'      | 11"- 2': Silty SAND with Gravel (SM), fine to medium, ~20% fines, ~20% fine to coarse gravel, light brown, moist |
|                | M              | Fill                | 2'-6.1': Silty SAND with Gravel (SM), fine to medium, ~15% fines, ~20% fines gravel, light brown, moist          |
|                | M              |                     | See remark 2   |
|                | M              |                     | Boulder of ~3' diameter at depth of 3.5'   |
|                | M              |                     |  |
| 10 ft          | M              | Silty Sand<br>~6.1' |  |
|                | M              |                     | 6.1'- 9.5': Silty SAND (SM), fine, ~15% fines, trace of gravel, light brown, moist                               |
|                | M              |                     |  |
|                | M              |                     |  |
|                | M              | ~9.5'               |  |
|                |                |                     | Bottom of test pit at 9.5'. Backfilled with excavated material in 2' lifts and compacted with excavator bucket.  |
| 15 ft          |                |                     |  |
|                |                |                     |  |
|                |                |                     |  |
|                |                |                     |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.
- Encountered cobbles and boulders up to 2' in diameter from 2' to 6'.

|                           |  |                      |                        |
|---------------------------|--|----------------------|------------------------|
| Project:                  | <b>Proposed Worcester South High School, Worcester, MA</b> |                      |                        |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>             |                      | LGCI Project No.: 1644 |
| Excavation Subcontractor: | Northern Drill Service                                     | Date Started:        | 08/14/17               |
| Excavation Foreman:       | Dave Edilberti   | Date Completed:      | 08/14/17               |
| LGCI Engineer:            | Hadi Kazemiroodsari  | Location:            | Eastern side of track  |
| Ground Surface El:        | 766' (see remark 1)  | Total Depth:         | 12.3'                  |
| Groundwater Depth:        | NE   | Excavator Type:      | Komatsu PC-120         |
|                           |  | Test Pit Dimensions: | 3'2" x 14'             |

| Depth Scale | Exc. Effort | Strata                           | Soil Description   |
|-------------|-------------|----------------------------------|--|
| 5 ft        | M           | Topsoil<br>~10"                  | 0"- 10": Silty SAND (SM), fine, ~35% fines, trace fine gravel, dark brown, moist   |
|             | M           | Fill<br>~4'                      | 10"- 4': Poorly graded SAND with Silt and Gravel (SP-SM), fine to medium, ~10% fines, ~25% gravel, cobbles, light brown, moist |
|             | M           |                                  | Boulder of ~1' diameter at 2'  |
|             | M           |                                  |  |
|             | M           | Buried Organics                  | 4'- 4.7': Silty SAND (SM), fine, ~30% fines, trace organics, gray to black, moist  |
| 10 ft       | M           | Silty Sand with Gravel<br>~12.3' | 4.7' - 12.3': Silty SAND with Gravel (SM), fine to medium, ~15% fines, ~10% gravel, light brown, cobbles, moist                |
|             | M           |                                  | Boulder of ~1' diameter at 6'  |
|             | M           |                                  |  |
|             | M           |                                  |  |
|             | M           |                                  |  |
| 15 ft       | D           |                                  |  |
|             | D           |                                  |  |
|             | D           |                                  | Bottom of test pit at 12.3'. Backfilled with excavated material in 2' lifts and compacted with excavator bucket.               |
|             |             |                                  |  |
|             |             |                                  |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.

|                           |   |                      |                        |
|---------------------------|---|----------------------|------------------------|
| Project:                  | Proposed Worcester South High School, Worcester, MA |                      |                        |
| Client:                   | Lamoureux Pagano & Associates, Inc.                 |                      | LGCI Project No.: 1644 |
| Excavation Subcontractor: | Northern Drill Service                              | Date Started:        | 08/14/17               |
| Excavation Foreman:       | Dave Edilberti                                      | Date Completed:      | 08/14/17               |
| LGCI Engineer:            | Hadi Kazemiroodsari                                 | Location:            | Western side of track  |
| Ground Surface El:        | 766' (see remark 1)                                 | Total Depth:         | 12'                    |
| Groundwater Depth:        | NE  | Excavator Type:      | Komatsu PC-120         |
|                           |   | Test Pit Dimensions: | 3'9" x 12'             |

| Depth<br>Scale | Exc.<br>Effort | Strata                          | Soil Description  |
|----------------|----------------|---------------------------------|---|
| 5 ft           | M              | Topsoil<br>~7"                  | 0"-7": Silty SAND (SM), fine, ~35% fines, trace organics, roots, dark brown, moist  |
|                | M              | Subsoil<br>~1.5'                | 7"- 1.5': Silty SAND (SM), fine to medium, ~15% fines, ~20% gravel, light brown, moist<br>Boulder of 1.5' diameter at depth of 2'                 |
|                | M              | Silty<br>Sand<br>with<br>Gravel | 1.5'- 8': Silty SAND with Gravel (SM), fine to medium, ~20% fines, ~25% fine gravel, light brown, moist (Top 2' appeared reworked. Possible Fill) |
|                | M              |                                 |   |
|                | M              |                                 |   |
| 10 ft          | M              |                                 |   |
|                | M              |                                 |   |
|                | M              |                                 | 8' - 12': Silty SAND with Gravel (SM), fine to medium, 20-25 % fines, ~25% fine gravel, light brown, moist  |
|                | M              |                                 |   |
|                | M              |                                 |   |
| 15 ft          | M              | ~12'                            |   |
|                |                |                                 | Bottom of test pit at 12'. Backfilled with excavated material in 2' lifts and compacted with excavator bucket.                                    |
|                |                |                                 |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.

|                           |   |                      |                              |
|---------------------------|---|----------------------|------------------------------|
| Project:                  | Proposed Worcester South High School, Worcester, MA |                      |                              |
| Client:                   | Lamoureux Pagano & Associates, Inc.                 |                      | LGCI Project No.: 1644       |
| Excavation Subcontractor: | Northern Drill Service                              | Date Started:        | 08/14/17                     |
| Excavation Foreman:       | Dave Edilberti                                      | Date Completed:      | 08/14/17                     |
| LGCI Engineer:            | Hadi Kazemiroodsari                                 | Location:            | Northwestern corner of track |
| Ground Surface El:        | 766' (see remark 1)                                 | Total Depth:         | 10.8'                        |
| Groundwater Depth:        | NE  | Excavator Type:      | Komatsu PC-120               |
|                           |   | Test Pit Dimensions: | 3'2" x 10'                   |

| Depth<br>Scale | Exc.<br>Effort | Strata                             | Soil Description   |
|----------------|----------------|------------------------------------|--|
| 5 ft           | M              | Topsoil<br>~8"                     | 0" - 8": Silty SAND (SM), fine, ~30% fines, trace organics, roots, dark brown, moist   |
|                | M              | Subsoil<br>~2.1'                   | 8" - 2.1': Poorly graded SAND with Silt & Gravel (SP-SM), fine to medium, 10-15% fines, ~15% gravel, trace organics, roots, light brown, moist |
|                | M              | Sand<br>with Silt<br>and<br>Gravel | 2.1' - 10.8': Poorly graded SAND with Silt & Gravel (SP-SM), fine, 10-15% fines, 10-15% fine gravel, light brown, moist                        |
|                | M              |                                    | See remark 2   |
|                | M              |                                    |  |
|                | M              |                                    |  |
|                | M              |                                    |  |
|                | M              |                                    |  |
|                | M              |                                    |  |
|                | M              |                                    |  |
| 10 ft          | M              |                                    |  |
|                | M              |                                    |  |
| 15 ft          |                |                                    | Bottom of test pit at 10.8'. Backfilled with excavated material in 2' lifts and compacted with excavator bucket.                               |
|                |                |                                    |  |
|                |                |                                    |  |
|                |                |                                    |  |
|                |                |                                    |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.
- Encountered cobbles and boulders (<5%) up to 1' in diameter from 1' to 10.8'.



|                           |  |                      |                              |
|---------------------------|--|----------------------|------------------------------|
| Project:                  | <b>Proposed Worcester South High School, Worcester, MA</b> |                      |                              |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>             |                      | LGCI Project No.: 1644       |
| Excavation Subcontractor: | Northern Drill Service                                     | Date Started:        | 08/14/17                     |
| Excavation Foreman:       | Dave Edilberti   | Date Completed:      | 08/14/17                     |
| LGCI Engineer:            | Hadi Kazemiroodsari  | Location:            | Northeastern corner of track |
| Ground Surface El:        | 766' (see remark 1)  | Total Depth:         | 12.7'                        |
| Groundwater Depth:        | NE   | Excavator Type:      | Komatsu PC-120               |
|                           |  | Test Pit Dimensions: | 3' x 5.5'                    |

| Depth<br>Scale | Exc.<br>Effort | Strata                           | Soil Description   |
|----------------|----------------|----------------------------------|--|
| 5 ft           | M              | Topsoil<br>~1'                   | 0" - 1': Silty SAND (SM), fine, ~35% fines, trace organics, roots, dark brown, moist   |
|                | M              | Subsoil<br>~2'                   | 1' - 2': Silty SAND (SP-SM), fine, ~20% fines, light brown, moist  |
|                | M              | Fill<br>~4'                      | 2' - 4': Silty SAND with Gravel (SM), fine, 20-25% fines, 15-20% fine gravel, 6"-12" angular cobbles, trace roots, trace organic fines, light brown, moist |
|                | M              |                                  |  |
|                | M              | Silty Sand with Gravel<br>~12.7' | 4' - 12.7': Silty SAND with Gravel (SM), fine, 20-25% fines, 15-20% fine gravel, light brown, moist  |
| 10 ft          | M              |                                  |  |
|                | M              |                                  |  |
|                | M              |                                  |  |
|                | M              |                                  |  |
|                | M              |                                  |  |
| 15 ft          | M              |                                  |  |
|                | M              |                                  |  |
|                | M              |                                  |  |
|                | M              |                                  |  |
|                | M              |                                  |  |
|                |                |                                  | Bottom of test pit at 12.7'. Backfilled with excavated material in 2' lifts and compacted with excavator bucket.   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.

|                           |  |                      |  |
|---------------------------|--|----------------------|--|
| Project:                  | <b>Proposed Worcester South High School, Worcester, MA</b> |                      |  |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>             |                      | LGCI Project No.: 1644                 |
| Excavation Subcontractor: | Northern Drill Service                                     | Date Started:        | 08/14/17                               |
| Excavation Foreman:       | Dave Edilberti   | Date Completed:      | 08/14/17                               |
| LGCI Engineer:            | Hadi Kazemiroodsari  | Location:            | Athletic field NW of existing building |
| Ground Surface El:        | 767' (see remark 1)  | Total Depth:         | 9.8'                                   |
| Groundwater Depth:        | 8.7' Water seeped in the excavation                        | Excavator Type:      | Komatsu PC-120                         |
|                           |  | Test Pit Dimensions: | 3' x 9.5'                              |

| Depth Scale | Exc. Effort | Strata                      | Soil Description  |
|-------------|-------------|-----------------------------|---|
| 5 ft        | E           | Topsoil ~7'                 | 0"- 7": Silty SAND (SM), fine, ~30% fines, trace organics, roots, dark brown, moist                               |
|             | E           | Subsoil ~2'                 | 7"- 2': Poorly graded SAND with Gravel (SP), fine to medium, ~20% fine gravel, light brown, moist<br>See remark 2 |
|             | E           | Silty Sand and Gravel ~9.8' | 2'- 9.8': Silty SAND with Gravel (SM), fine to medium, 15-20% fines, ~15% fine gravel, light brown, moist         |
|             | E           |                             |   |
|             | E           |                             |   |
|             | E           |                             |   |
|             | E           |                             |   |
|             | E           |                             |   |
|             | E           |                             |   |
|             | E           |                             |   |
| 10 ft       | E           |                             |   |
|             |             |                             | Bottom of test pit at 9.8'. Backfilled with excavated material in 2' lifts and compacted with excavator bucket.   |
|             |             |                             |   |
|             |             |                             |   |
|             |             |                             |   |
| 15 ft       |             |                             |   |
|             |             |                             |   |
|             |             |                             |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.
- Encountered cobbles and boulders up to 1' in diameter starting at 1'.

|                           |   |                      |  |
|---------------------------|---|----------------------|--|
| Project:                  | Proposed Worcester South High School, Worcester, MA |                      |  |
| Client:                   | Lamoureux Pagano & Associates, Inc.                 |                      | LGCI Project No.: 1644                 |
| Excavation Subcontractor: | Northern Drill Service                              | Date Started:        | 08/14/17                               |
| Excavation Foreman:       | Dave Edilberti                                      | Date Completed:      | 08/14/17                               |
| LGCI Engineer:            | Hadi Kazemiroodsari                                 | Location:            | Athletic field NW of existing building |
| Ground Surface El:        | 767.5' (see remark 1)                               | Total Depth:         | 9.4'                                   |
| Groundwater Depth:        | NE  | Excavator Type:      | Komatsu PC-120                         |
|                           |   | Test Pit Dimensions: | 3'2" x 8'5"                            |

| Depth<br>Scale | Exc.<br>Effort | Strata                          | Soil Description   |
|----------------|----------------|---------------------------------|--|
| 5 ft           | M              | Topsoil<br>~10"                 | 0"-10": Silty SAND (SM), fine, ~35% fines, trace organics, roots, dark brown, moist  |
|                | M              | Fill                            | 10"-5': Silty SAND with Gravel (SM), fine to medium, ~10-15% fines, ~20% gravel, trace organics, roots, light brown, moist |
|                | M              |                                 | See remark 2   |
|                | M              |                                 | Boulder of 1' in diameter encountered at 1.5'  |
|                | M              |                                 |  |
| 10 ft          | M              | Buried<br>Topsoil<br>~6'        | 5'-6': Silty SAND with Gravel (SM), fine to medium, ~20% fines, ~20% gravel, trace roots and wood, gray, moist             |
|                | M              | Silty<br>Sand<br>with<br>Gravel | 6' - 9.4': Silty SAND with Gravel (SM), fine to medium, ~20% fines, ~20% gravel, gray, moist                               |
|                | M              |                                 | Boulder of 1' in diameter encountered at 7.5'  |
|                | M              |                                 |  |
|                | M              |                                 |  |
| 15 ft          |                |                                 | Bottom of test pit at 9.4'. Backfilled with excavated material in 2' lifts and compacted with excavator bucket.            |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.
- Encountered cobbles and boulders up to 1' in diameter below the depth of 1.5'.

|                           |  |                      |  |
|---------------------------|--|----------------------|--|
| Project:                  | <b>Proposed Worcester South High School, Worcester, MA</b> |                      |  |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>             |                      | LGCI Project No.: 1644                 |
| Excavation Subcontractor: | Northern Drill Service                                     | Date Started:        | 08/14/17                               |
| Excavation Foreman:       | Dave Edilberti   | Date Completed:      | 08/14/17                               |
| LGCI Engineer:            | Hadi Kazemiroodsari  | Location:            | Athletic field NW of existing building |
| Ground Surface El:        | 769' (see remark 1)  | Total Depth:         | 10'                                    |
| Groundwater Depth:        | NE   | Excavator Type:      | Komatsu PC-120                         |
|                           |  | Test Pit Dimensions: | 3.5' x 7.5'                            |

| Depth<br>Scale | Exc.<br>Effort | Strata                      | Soil Description   |
|----------------|----------------|-----------------------------|--|
| 5 ft           | M              | Topsoil                     | 0" - 7": Silty SAND (SM), fine, ~35% fines, trace organics, roots, dark brown, moist   |
|                | M              | Fill<br>~2.1'               | 7" - 2.1': Poorly graded SAND with Silt & Gravel (SP-SM), fine to medium, ~10% fines, ~25 gravel, trace trash, light brown, moist<br>Angular boulders of ~2' in diameter encountered at 1' |
|                | M              | Sand with<br>Gravel<br>~10' | 2.1' - 10': Silty SAND with Gravel (SM), fine to medium, ~20% fines, ~20% gravel, light brown, moist   |
|                | M              |                             |  |
|                | M              |                             |  |
|                | M              |                             |  |
|                | M              |                             |  |
|                | M              |                             |  |
|                | M              |                             |  |
|                | M              |                             |  |
| 10 ft          | M              |                             |  |
|                |                |                             | Bottom of test pit at 10'. Backfilled with excavated material in 2' lifts and compacted with excavator bucket.   |
|                |                |                             |  |
|                |                |                             |  |
|                |                |                             |  |
| 15 ft          |                |                             |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.



|                           |  |                      |                           |
|---------------------------|--|----------------------|---------------------------|
| Project:                  | <b>Proposed Worcester South High School, Worcester, MA</b> |                      |                           |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>             |                      | LGCI Project No.: 1644    |
| Excavation Subcontractor: | Northern Drill Service                                     | Date Started:        | 08/14/17                  |
| Excavation Foreman:       | Dave Edilberti   | Date Completed:      | 08/14/17                  |
| LGCI Engineer:            | Hadi Kazemiroodsari  | Location:            | West of existing building |
| Ground Surface El:        | 769.5' (see remark 1)                                      | Total Depth:         | 10.1'                     |
| Groundwater Depth:        | ~10' Water seeped in from the bottom of excavation         | Excavator Type:      | Komatsu PC-120            |
|                           |  | Test Pit Dimensions: | 4' x 9'                   |

| Depth Scale | Exc. Effort | Strata                    | Soil Description   |
|-------------|-------------|---------------------------|--|
| 5 ft        | M           | Topsoil                   | 0" - 1.5': Silty SAND (SM), fine, ~35% fines, trace organics, roots, dark brown, moist   |
|             | M           | ~1.5'                     |  |
|             | M           | Fill                      | 1.5' - 3': Silty SAND with Gravel (SM), fine to medium, ~15% fines, ~20% gravel, light brown, moist  |
|             | M           |                           |  |
|             | M           |                           | 3' - 6.5': SILT with Sand and Gravel (ML), highly plastic, 25-30% fine sand, ~10% gravel, possible traces of coal ash, ~5% angular to subangular cobbles and boulders, gray, moist (possible stone dust) |
| 10 ft       | M           |                           |  |
|             | M           |                           |  |
|             | M           | ~6.5'                     |  |
|             | M           | Silt with Sand and Gravel | 6.5' - 10.1': SILT with Sand and Gravel (ML), plastic, 25-30% fine sand, ~10% gravel, light brown, moist   |
|             | M           |                           |  |
| 15 ft       | M           | ~10.1'                    |  |
|             | M           |                           | Bottom of test pit at 10.1'. Backfilled with excavated material in 2' lifts and compacted with excavator bucket.   |
|             |             |                           |  |
|             |             |                           |  |
|             |             |                           |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.

|   |                                      |
|---|--------------------------------------|
| Project: <b>Proposed Worcester South High School, Worcester, MA</b> |                                      |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>              | LGCI Project No.: 1644               |
| Excavation Subcontractor: Northern Drill Service                    | Date Started: 08/15/17               |
| Excavation Foreman: Dave Edilberti                                  | Date Completed: 08/15/17             |
| LGCI Engineer: Hadi Kazemiroodsari                                  | Location: North of existing building |
| Ground Surface El: 766' (see remark 1)                              | Total Depth: 10'                     |
| Groundwater Depth: NE   | Excavator Type: Komatsu PC-120       |
|   | Test Pit Dimensions: 3' x 9'         |

| Depth<br>Scale | Exc.<br>Effort | Strata   | Soil Description   |
|----------------|----------------|--|--|
| 5 ft           | M              | Topsoil<br>~10"  | 0"-10": Silty SAND (SM), fine, ~30% fines, trace organics, roots, dark brown, moist  |
|                | M              |   | 10"-1.5': Silty SAND with Gravel (SM), fine to medium, ~15% fines, ~20% gravel, light brown, moist                               |
|                | M              |  | 1.5'- 4': Silty SAND with Gravel (SM), fine, ~20% fines, ~15% gravel, angular cobbles and boulders up to 18", light brown, moist |
|                | M              |  |  |
|                | M              |  | ~4'  |
|                | M              |  |  |
|                | M              |  |  |
|                | M              |  |  |
|                | M              |  |  |
|                | M              |  |  |
| 10 ft          | M              | ~10'   | Bottom of test pit at 10'. Backfilled with excavated material in 2' lifts and compacted with excavator bucket.                   |
| 15 ft          |                |  |  |
|                |                |  |  |
|                |                |  |  |
|                |                |  |  |
|                |                |  |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation interpolated to the nearest 1/2 foot from progress survey plan provided to LGCI by Lamoureux Pagano & Associates, Inc. via email on August 4, 2017.



|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                         |
| Excavation Subcontractor: Northern Drill Service, Inc.                         | Date Started: 02/13/18                         |
| Excavation Foreman: Dave Edilberti   | Date Completed: 02/14/18                       |
| LGCI Engineer: Malinda Chea  | Location: NE corner of northern athletic field |
| Ground Surface El: ~765.9 ft. (see remark 1)                                   | Total Depth: 13 feet                           |
| Groundwater Depth: NE  | Excavator Type: Komatsu PC-120                 |
|  | Test Pit Dimensions: 8 ft. x 13 ft.            |

| Depth Scale | Exc. Effort | Strata            | Soil Description   |
|-------------|-------------|-------------------|--|
| 5 ft        | E           | Topsoil<br>~1 ft. | 0" - 1' : Silty SAND (SM), fine, 25-30% fines, trace organic fines, trace roots, dark brown, moist                               |
|             | E           | Fill              | 1' - 7' : Silty SAND with Gravel (SM), fine to coarse, 30-35% fines, 15-20% fine to coarse subangular gravel, light brown, moist |
|             | E           |                   |  |
|             | E           |                   |  |
|             | E           |                   |  |
|             | E           |                   |  |
|             | E           | ~7 ft.            |  |
| 10 ft       | E           | Sand<br>~13 ft.   | 7' - 13' : Silty SAND (SM), fine, trace medium, 15-20% fines, 10-15% fine gravel, orange to brown, moist                         |
|             | E           |                   |  |
|             | E           |                   |  |
|             | E           |                   |  |
|             | E           |                   |  |
|             | E           |                   |  |
|             | E           |                   |  |
| 15 ft       |             |                   | Bottom of test pit at 13 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.  |
|             |             |                   |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.
- Infiltration test was performed at a depth of 3 feet.



|                           |  |                      |  |
|---------------------------|--|----------------------|--|
| Project:                  | Proposed Worcester South High School, Worcester, Massachusetts |                      |  |
| Client:                   | Lamoureux Pagano & Associates, Inc.                            |                      | LGCI Project No.: 1644                   |
| Excavation Subcontractor: | Northern Drill Service, Inc.                                   | Date Started:        | 02/12/18                                 |
| Excavation Foreman:       | Dave Edilberti   | Date Completed:      | 02/12/18                                 |
| LGCI Engineer:            | Tom Sinnott  | Location:            | Southern edge of northern athletic field |
| Ground Surface El:        | ~766.4 ft. (see remark 1)                                      | Total Depth:         | 12.5 feet                                |
| Groundwater Depth:        | NE   | Excavator Type:      | Komatsu PC-120                           |
|                           |  | Test Pit Dimensions: | 5 ft. x 12.5 ft.                         |

| Depth<br>Scale | Exc.<br>Effort | Strata    | Soil Description  |
|----------------|----------------|-----------|---|
| 5 ft           | M              | Topsoil   | 0" - 1.3' : Silty SAND with Gravel (SM), fine, trace medium, 20-25% fines, ~15% fine gravel, trace of organic fines, trace roots, dark brown, moist |
|                | M              | ~1.3 ft.  | 1.3' - 2' : Silty SAND (SM), fine, trace medium, ~15% fines, ~5% fine gravel, trace roots, brown, moist   |
|                | M              | Fill      | 2' - 6' : Silty SAND (SM), fine to medium, trace coarse, 45-50% fines, 5-10% fine subangular gravel, trace roots, trace organic fines, brown, moist |
|                | M              |           |   |
|                | M              |           |   |
|                | M              |           |   |
| 10 ft          | D              | Sand      | 6' - 12.5' : Silty SAND with Gravel (SM), fine, trace medium, ~20% fines, 25-30% fine gravel, light brown, moist                                    |
|                | D              |           |   |
|                | D              |           |   |
|                | D              |           |   |
|                | D              |           |   |
|                | D              |           |   |
|                | D              |           |   |
|                | D              |           |   |
| 15 ft          |                | ~12.5 ft. | Bottom of test pit at 12.5 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.                   |
|                |                |           |   |
|                |                |           |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.





|  |   |                         |                        |
|--|---|-------------------------|------------------------|
| Project:   | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                         |                        |
| Client:  | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                         | LGCI Project No.: 1644 |
| Excavation Subcontractor: Northern Drill Service, Inc. | Date Started:   | 02/12/18                |                        |
| Excavation Foreman: Dave Edilberti                     | Date Completed:   | 02/12/18                |                        |
| LGCI Engineer: Tom Sinnott                             | Location:   | Northern athletic field |                        |
| Ground Surface El: ~767.0 ft. (see remark 1)           | Total Depth:  | 12 feet                 |                        |
| Groundwater Depth: NE                                  | Excavator Type:   | Komatsu PC-120          |                        |
|  | Test Pit Dimensions:  | 5 ft. x 13 ft.          |                        |

| Depth Scale | Exc. Effort | Strata   | Soil Description  |
|-------------|-------------|----------|---|
| 5 ft        | D           | Topsoil  | 0" - 1.3' : Silty SAND (SM), fine, trace medium, trace coarse, 5-10% fines, trace fine gravel, trace of organic fines, trace roots, dark brown, moist |
|             | M           | ~1.3 ft. | 1.3' - 2.1' : Silty SAND with Gravel (SM), fine, trace medium, ~20% fines, 20-25% fine angular gravel, trace of organic fines, brown, moist           |
|             | M           | Fill     | 2.1' - 5' : Silty SAND with Gravel (SM), fine, ~20% fines, 25-30% fine gravel, light brown, moist   |
|             | M           |          |   |
|             | M           |          |   |
| 10 ft       | D           | Sand     | 5' - 12' : Silty SAND (SM), fine, trace medium, 15-20% fines, ~5% fine gravel, light brown, moist   |
|             | D           |          |   |
|             | D           |          |   |
|             | D           |          |   |
|             | D           |          |   |
|             | D           |          |   |
|             | D           |          |   |
| 15 ft       |             | ~12 ft.  | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.                       |
|             |             |          |   |
|             |             |          |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.



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| Depth Scale | Exc. Effort | Strata              | Soil Description   |
|-------------|-------------|---------------------|--|
| 5 ft        | M           | Topsoil<br>~0.7 ft. | 0" - 0.7' : Silty SAND with Gravel (SM), fine, ~25% fines, ~20% fine angular gravel, trace of organic fines, trace roots, trace grass, dark brown, moist |
|             | M           | Fill<br>~2 ft.      | 0.7' - 2' : Silty SAND with Gravel (SM), fine, trace medium, ~20% fines, 15-20% fine gravel, trace of organic fines, brown, moist                        |
|             | D           | Sand<br>~12 ft.     | 2' - 12' : Silty SAND (SM), fine, 15-20% fines, ~5% fine gravel, light brown, moist<br><br>Encountered boulders up to 2.5 feet in diameter.              |
|             | D           |                     |  |
|             | D           |                     |  |
|             | D           |                     |  |
|             | D           |                     |  |
|             | D           |                     |  |
|             | D           |                     |  |
|             | D           |                     |  |
|             | D           |                     |  |
|             | D           |                     |  |
|             | 10 ft       |                     |  |
|             |             |                     |  |
|             |             |                     |  |
| 15 ft       |             |                     | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.                          |
|             |             |                     |  |
|             |             |                     |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.



|  |  |
|--|--|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |  |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                             |
| Excavation Subcontractor: Northern Drill Service, Inc.                         | Date Started: 02/13/18                             |
| Excavation Foreman: Dave Edilberti   | Date Completed: 02/22/18                           |
| LGCI Engineer: Malinda Chea  | Location: Southern edge of northern athletic field |
| Ground Surface El: ~766.0 ft. (see remark 1)                                   | Total Depth: 12 feet                               |
| Groundwater Depth: ~9 ft. water seeped in                                      | Excavator Type: Komatsu PC-120                     |
|  | Test Pit Dimensions: 3.3 ft. x 13.3 ft.            |

| Depth Scale | Exc. Effort | Strata                     | Soil Description  |
|-------------|-------------|----------------------------|---|
| 5 ft        | D           | Topsoil ~0.8 ft.           | 0" - 0.8' : Silty SAND (SM), fine, 25-30% fines, trace of organic fines, trace roots, dark brown, frozen  |
|             | M           | Fill<br>~5 ft.             | 0.8' - 5' : Silty SAND with Gravel (SM), fine, ~20% fines, 20-25% fine to coarse angular gravel, 5-10% cobbles, trace roots, light brown, moist |
|             | M           |                            | Encountered ~5% boulders up to 1.5 feet in diameter.  |
|             | M           |                            |   |
|             | M           |                            |   |
| 10 ft       | M           | Sand and Gravel<br>~12 ft. | 5' - 9' : Silty SAND with Gravel (SM), fine, ~20% fines, 15-20% fine to coarse gravel, 0-5% cobbles, light brown, moist                         |
|             | M           |                            | 9' - 12' : Silty SAND with Gravel (SM), fine, ~20% fines, 20-25% fine gravel, light brown, wet  |
|             | M           |                            |   |
|             | M           |                            |   |
|             | M           |                            |   |
| 15 ft       |             |                            | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.                 |
|             |             |                            |   |
|             |             |                            |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.
- Infiltration test was performed at a depth of 3 feet at the staked location. Due to rain water pooling over the weekend the test pit was moved 5 feet east of the staked location.
- A pocket of buried organic soil was observed on the western edge of the test pit at a depth ranging from 3.5 feet to 4.5 feet.



|                           |  |                      |  |
|---------------------------|--|----------------------|--|
| Project:                  | Proposed Worcester South High School, Worcester, Massachusetts |                      |  |
| Client:                   | Lamoureux Pagano & Associates, Inc.                            |                      | LGCI Project No.: 1644                   |
| Excavation Subcontractor: | Northern Drill Service, Inc.                                   | Date Started:        | 02/12/18                                 |
| Excavation Foreman:       | Dave Edilberti   | Date Completed:      | 02/12/18                                 |
| LGCI Engineer:            | Tom Sinnott  | Location:            | Northern edge of northern athletic field |
| Ground Surface El:        | ~766.5 ft. (see remark 1)                                      | Total Depth:         | 11 feet                                  |
| Groundwater Depth:        | NE   | Excavator Type:      | Komatsu PC-120                           |
|                           |  | Test Pit Dimensions: | 5 ft. x 13 ft.                           |

| Depth<br>Scale | Exc.<br>Effort | Strata                                | Soil Description  |
|----------------|----------------|---------------------------------------|---|
| 5 ft           | M              | Topsoil<br>~0.9 ft.                   | 0" - 0.9': Silty SAND (SM), fine, 25-30% fines, trace of organic fines, trace roots, dark brown, frozen                             |
|                | M              | Fill<br>~2 ft.                        | 0.9' - 2' : Silty SAND (SM), fine, 15-20% fines, ~5% fine angular gravel, trace of organic fines, trace roots, brown, moist         |
|                | D              | Sand<br>with<br>Gravel<br><br>~11 ft. | 2' - 11' : Silty SAND (SM), fine, ~20% fines, 5-10% fine gravel, light brown, moist<br><br>Encountered boulders 1 foot in diameter. |
|                | D              |                                       |   |
|                | D              |                                       |   |
|                | D              |                                       |   |
|                | D              |                                       |   |
|                | D              |                                       |   |
|                | D              |                                       |   |
|                | D              |                                       |   |
| 10 ft          | D              |                                       |   |
|                |                |                                       | Bottom of test pit at 11 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.     |
|                |                |                                       |   |
|                |                |                                       |   |
| 15 ft          |                |                                       |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.



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| Depth<br>Scale | Exc.<br>Effort | Strata                      | Soil Description   |
|----------------|----------------|-----------------------------|--|
| 5 ft           | M              | Topsoil<br>~0.7 ft.         | 0" - 0.7' : Silty SAND with Gravel (SM), fine, ~30% fines, ~25% fine gravel, trace of organic fines, trace roots, dark brown, wet              |
|                | M              | Fill<br>~1.9 ft.            | 0.7' - 1.9' : Silty SAND with Gravel (SM), fine, trace medium, ~20% fines, 30-35% fine to coarse angular gravel, brown, moist                  |
|                | D              | Sand with Gravel<br>~12 ft. | 1.9' - 12' : Poorly Graded SAND with Silt and Gravel (SP-SM), fine, trace medium, 10-15% fines, ~20% fine to coarse gravel, light brown, moist |
|                | D              |                             |  |
|                | D              |                             |  |
|                | D              |                             |  |
|                | D              |                             |  |
|                | D              |                             |  |
|                | D              |                             |  |
|                | D              |                             |  |
|                | D              |                             |  |
|                | D              |                             |  |
| 10 ft          |                |                             |  |
|                |                |                             |  |
|                |                |                             |  |
| 15 ft          |                |                             | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.                |
|                |                |                             |  |
|                |                |                             |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.



|  |   |
|--|---|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |   |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                  |
| Excavation Subcontractor: Northern Drill Service, Inc.                         | Date Started: 02/13/18                  |
| Excavation Foreman: Dave Edilberti   | Date Completed: 02/13/18                |
| LGCI Engineer: Malinda Chea  | Location: Eastern edge of playing field |
| Ground Surface El: ~769.0 ft. (see remark 1)                                   | Total Depth: 12 feet                    |
| Groundwater Depth: NE  | Excavator Type: Komatsu PC-120          |
|  | Test Pit Dimensions: 3 ft. x 9.9 ft.    |

| Depth<br>Scale | Exc.<br>Effort | Strata                            | Soil Description  |
|----------------|----------------|-----------------------------------|---|
| 5 ft           | M              | Topsoil<br>~0.8 ft.               | 0" - 0.8' : Silty SAND (SM), fine, ~30% fines, trace of organic fines, trace roots, dark brown, frozen  |
|                | M              | Fill<br>~3.5 ft.                  | 0.8' - 3.5' : Silty SAND with Gravel (SM), fine, 15-20% fines, 20-25% fine to coarse angular gravel, trace roots, light brown, moist              |
|                | M              |                                   |   |
|                | M              |                                   |   |
| 10 ft          | M              | Sand<br>with<br>Gravel<br>~12 ft. | 3.5' - 12' : Poorly Graded SAND with Silt and Gravel (SP-SM), fine, trace medium, 10-15% fines, 15-20% fine subangular gravel, light brown, moist |
|                | M              |                                   |   |
|                | M              |                                   |   |
|                | M              |                                   |   |
|                | M              |                                   |   |
|                | M              |                                   |   |
|                | M              |                                   |   |
|                | M              |                                   |   |
| 15 ft          |                |                                   | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.                   |
|                |                |                                   |   |
|                |                |                                   |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.



|                           |   |                      |                            |
|---------------------------|---|----------------------|----------------------------|
| Project:                  | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                      |                            |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                      | LGCI Project No.: 1644     |
| Excavation Subcontractor: | Northern Drill Service, Inc.  | Date Started:        | 02/13/18                   |
| Excavation Foreman:       | Dave Edilberti  | Date Completed:      | 02/13/18                   |
| LGCI Engineer:            | Malinda Chea  | Location:            | NE corner of playing field |
| Ground Surface El:        | ~767.1 ft. (see remark 1)   | Total Depth:         | 12 feet                    |
| Groundwater Depth:        | ~8.8 ft. water seeped in  | Excavator Type:      | Komatsu PC-120             |
|                           |   | Test Pit Dimensions: | 4 ft. x 13 ft.             |

| Depth Scale | Exc. Effort | Strata           | Soil Description   |
|-------------|-------------|------------------|--|
| 5 ft        | D           | Topsoil ~0.8 ft. | 0" - 0.8' : Silty SAND (SM), fine, 25-30% fines, trace of organic fines, trace roots, dark brown, frozen   |
|             | M           | Fill             | 0.8' - 5' : Silty SAND with Gravel (SM), fine, trace medium, 15-20% fines, 30-35% fine to coarse angular gravel, trace roots, light brown moist<br>Encountered rebar from 1 to 1.5 feet.<br>Encountered ~5% cobbles/boulders up to 1 foot in diameter. |
|             | M           |                  |  |
|             | M           |                  |  |
|             | M           |                  |  |
| 10 ft       | M           | Sand and Gravel  | 5' - 12' : Silty SAND with Gravel (SM), fine, trace medium, 15-20% fines, ~20% fine gravel, light brown, moist   |
|             | M           |                  |  |
|             | M           |                  |  |
|             | M           |                  |  |
|             | M           |                  |  |
|             | M           |                  |  |
|             | M           |                  |  |
|             | M           |                  |  |
| 15 ft       |             |                  | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.  |
|             |             |                  |  |
|             |             |                  |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.



|                           |  |                      |   |
|---------------------------|--|----------------------|---|
| Project:                  | Proposed Worcester South High School, Worcester, Massachusetts |                      |   |
| Client:                   | Lamoureux Pagano & Associates, Inc.                            |                      | LGCI Project No.: 1644                  |
| Excavation Subcontractor: | Northern Drill Service, Inc.                                   | Date Started:        | 02/12/18                                |
| Excavation Foreman:       | Dave Edilberti   | Date Completed:      | 02/12/18                                |
| LGCI Engineer:            | Tom Sinnott  | Location:            | Eastern edge of northern athletic field |
| Ground Surface El:        | ~767.0 ft. (see remark 1)                                      | Total Depth:         | 12 feet                                 |
| Groundwater Depth:        | NE   | Excavator Type:      | Komatsu PC-120                          |
|                           |  | Test Pit Dimensions: | 5 ft. x 11 ft.                          |

| Depth<br>Scale | Exc.<br>Effort | Strata            | Soil Description  |
|----------------|----------------|-------------------|---|
|                | M              | Topsoil<br>~1 ft. | 0" - 1' : Silty SAND (SM), fine, 25-30% fines, trace fine gravel, trace of organic fines, trace roots, dark brown, moist                    |
|                | M              | Fill<br>~4 ft.    | 1' - 4' : Poorly Graded SAND with Silt (SP-SM), fine, trace medium, 10-15% fines, ~10% fine gravel, trace roots, light brown moist          |
|                | M              |                   |   |
|                | M              |                   |   |
| 5 ft           | D              | Sand<br>~12 ft.   | 4' - 12' : Silty SAND (SM), fine, 15-20% fines, 5-10% fine gravel, light brown, moist<br><br>Encountered boulders up to 2 feet in diameter. |
|                | D              |                   |   |
|                | D              |                   |   |
|                | D              |                   |   |
|                | D              |                   |   |
| 10 ft          | D              |                   |   |
|                | D              |                   |   |
|                | D              |                   |   |
|                | D              |                   |   |
|                |                |                   |   |
| 15 ft          |                |                   | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.             |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.





|                           |   |                      |                                      |
|---------------------------|---|----------------------|--------------------------------------|
| Project:                  | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                      |                                      |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                      | LGCI Project No.: 1644               |
| Excavation Subcontractor: | Northern Drill Service, Inc.  | Date Started:        | 02/12/18                             |
| Excavation Foreman:       | Dave Edilberti  | Date Completed:      | 02/12/18                             |
| LGCI Engineer:            | Tom Sinnott   | Location:            | NE corner of northern athletic field |
| Ground Surface El:        | ~766.3 ft. (see remark 1)   | Total Depth:         | 12 feet                              |
| Groundwater Depth:        | NE  | Excavator Type:      | Komatsu PC-120                       |
|                           |   | Test Pit Dimensions: | 5 ft. x 12 ft.                       |

| Depth<br>Scale | Exc.<br>Effort | Strata                      | Soil Description  |
|----------------|----------------|-----------------------------|---|
| 5 ft           | M              | Topsoil<br>~0.8 ft.         | 0" - 0.8' : Silty SAND (SM), fine, ~20% fines, trace fine gravel, trace of organic fines, trace roots, dark brown, moist                            |
|                | M              | Fill<br>~5 ft.              | 0.8' - 5' : Silty SAND with Gravel (SM), fine to coarse, 25-30% fines, 30-35% fine to coarse subangular gravel, trace of organic fines, brown moist |
|                | M              |                             |   |
|                | M              |                             |   |
|                | M              |                             |   |
| 10 ft          | M              | Buried<br>Topsoil<br>~7 ft. | 5' - 7' : Silty SAND (SM), fine, ~25% fines, 10-15% fine to coarse gravel, trace of organic fines, trace roots, trace wood, dark brown, moist       |
|                | M              |                             |   |
|                | D              | Sand<br>~12 ft.             | 7' - 12' : Silty SAND (SM), fine, trace medium, 15-20% fines, ~5% fine gravel, light brown, moist   |
|                | D              |                             |   |
|                | D              |                             |   |
|                | D              |                             |   |
|                | D              |                             |   |
|                |                |                             | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.                     |
|                |                |                             |   |
|                |                |                             |   |
| 15 ft          |                |                             |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.



|                           |  |                      |  |
|---------------------------|--|----------------------|--|
| Project:                  | Proposed Worcester South High School, Worcester, Massachusetts |                      |  |
| Client:                   | Lamoureux Pagano & Associates, Inc.                            |                      | LGCI Project No.: 1644                 |
| Excavation Subcontractor: | Northern Drill Service, Inc.                                   | Date Started:        | 02/14/18                               |
| Excavation Foreman:       | Dave Edilberti   | Date Completed:      | 02/14/18                               |
| LGCI Engineer:            | Malinda Chea   | Location:            | West of the existing lower parking lot |
| Ground Surface El:        | ~752.5 ft. (see remark 1)                                      | Total Depth:         | 8.5 feet                               |
| Groundwater Depth:        | ~3.5 ft. water seeped in                                       | Excavator Type:      | Komatsu PC-120                         |
|                           |  | Test Pit Dimensions: | 7 ft. x 11 ft.                         |

| Depth<br>Scale | Exc.<br>Effort | Strata              | Soil Description  |
|----------------|----------------|---------------------|---|
| 5 ft           | M              | Topsoil<br>~3.5 ft. | 0" - 3.5' : Silty SAND (SM), fine, 25-30% fines, ~10% fine gravel, 0-5% cobbles, trace of organic fines, trace roots, trace wood, dark brown, moist<br>Encountered ~5% boulders up to 1.5 feet in diameter.<br>Encountered 3 boulders that were up to 4 feet in diameter. |
|                | D              |                     |   |
|                | D              |                     |   |
|                | D              |                     |   |
| 10 ft          | M              | Fill<br>~8 ft.      | 3.5' - 8' : Silty SAND (SM), fine, ~20% fines, 10-15% fine to coarse gravel, trace of organic fines, trace wood piece, gray to brown, moist<br>Encountered ~5% cobbles and boulders up to 1 foot in diameter.   |
|                | M              |                     |   |
|                | M              |                     |   |
|                | M              |                     |   |
|                | M              |                     |   |
| 15 ft          | M              | Sand<br>~8.5 ft.    | 8' - 8.5' : Silty SAND (SM), fine, 25-30% fines, gray, moist  |
|                |                |                     | Bottom of test pit at 8.5 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.  |
|                |                |                     |   |
|                |                |                     |   |
|                |                |                     |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.
2. The test pit was terminated at a depth of 8.5 feet due to soil collapsing along the walls of the excavation as water pooled inside the test pit.



|                           |   |                      |  |
|---------------------------|---|----------------------|--|
| Project:                  | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                      |  |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                      | LGCI Project No.: 1644                     |
| Excavation Subcontractor: | Northern Drill Service, Inc.  | Date Started:        | 02/13/18                                   |
| Excavation Foreman:       | Dave Edilberti  | Date Completed:      | 02/13/18                                   |
| LGCI Engineer:            | Malinda Chea  | Location:            | Eastern edge of existing lower parking lot |
| Ground Surface El:        | ~748.0 ft. (see remark 1)   | Total Depth:         | 14 feet                                    |
| Groundwater Depth:        | NE  | Excavator Type:      | Komatsu PC-120                             |
|                           |   | Test Pit Dimensions: | 5 ft. x 10 ft.                             |

| Depth<br>Scale | Exc.<br>Effort | Strata         | Soil Description  |
|----------------|----------------|----------------|---|
| 5 ft           | E              | Topsoil        | 0" - 1.5' : Silty SAND (SM), fine, 25-30% fines, trace of organic fines, trace roots, dark brown, moist                         |
|                | E              | ~1.5 ft.       |   |
|                | M              | Fill           | 1.5' - 10' : Silty SAND with Gravel (SM), fine, ~20% fines, 15-20% fine angular gravel, trace brick, light brown, moist         |
|                | M              |                | Encountered ~5% boulders up to 2 feet in diameter.  |
|                | M              |                |   |
|                | M              |                |   |
|                | M              |                |   |
|                | M              |                |   |
|                | M              |                |   |
|                | M              |                |   |
| 10 ft          | M              | ~10 ft.        |   |
|                | M              | Buried Topsoil | 10' - 12' : Silty SAND (SM), fine, ~30% fines, trace of organic fines, trace roots, dark brown, moist                           |
|                | M              | ~12 ft.        |   |
|                | M              | Sand           | 12' - 14' : Silty SAND (SM), fine to medium, trace coarse, ~15% fines, 5-10% fine gravel, light brown, moist                    |
|                | M              |                |   |
| 15 ft          |                |                | Bottom of test pit at 14 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket. |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.



|                           |  |                      |  |
|---------------------------|--|----------------------|--|
| Project:                  | Proposed Worcester South High School, Worcester, Massachusetts |                      |  |
| Client:                   | Lamoureux Pagano & Associates, Inc.                            |                      | LGCI Project No.: 1644                     |
| Excavation Subcontractor: | Northern Drill Service, Inc.                                   | Date Started:        | 02/13/18                                   |
| Excavation Foreman:       | Dave Edilberti   | Date Completed:      | 02/13/18                                   |
| LGCI Engineer:            | Malinda Chea   | Location:            | Eastern edge of existing lower parking lot |
| Ground Surface El:        | ~744.6 ft. (see remark 1)                                      | Total Depth:         | 14 feet                                    |
| Groundwater Depth:        | ~3.5 ft. water seeped in                                       | Excavator Type:      | Komatsu PC-120                             |
|                           |  | Test Pit Dimensions: | 7 ft. x 11 ft.                             |

| Depth<br>Scale | Exc.<br>Effort | Strata   | Soil Description  |
|----------------|----------------|----------|---|
| 5 ft           | E              | Topsoil  | 0" - 1.5' : Silty SAND (SM), fine, 25-30% fines, trace of organic fines, trace roots, dark brown, moist                         |
|                | E              | ~1.5 ft. |   |
|                | D              | Fill     | 1.5' - 3.5' : Silty SAND with Gravel (SM), fine, 15-20% fines, ~15% fine angular gravel, light brown, moist                     |
|                | D              |          | 3.5' - 12' : Silty SAND with Gravel (SM), fine, 20-25% fines, ~15% fine to coarse subangular gravel, gray to brown, moist       |
|                | M              |          | Encountered ~5% cobbles and boulders up to 1.5 feet in diameter.  |
| 10 ft          | M              |          |   |
|                | M              |          |   |
|                | D              |          |   |
|                | D              |          |   |
|                | D              |          |   |
| 15 ft          |                | ~12 ft.  |   |
|                |                |          | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket. |
|                |                |          |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.
2. The test pit was terminated at a depth of 12 feet due to encountering a large boulder that was difficult to remove.



|                           |   |                      |                               |
|---------------------------|---|----------------------|-------------------------------|
| Project:                  | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                      |                               |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                      | LGCI Project No.: 1644        |
| Excavation Subcontractor: | Northern Drill Service, Inc.  | Date Started:        | 02/13/18                      |
| Excavation Foreman:       | Dave Edilberti  | Date Completed:      | 02/13/18                      |
| LGCI Engineer:            | Malinda Chea  | Location:            | Eastern edge of playing field |
| Ground Surface El:        | ~768.7 ft. (see remark 1)   | Total Depth:         | 12 feet                       |
| Groundwater Depth:        | ~10.5 ft. water seeped in   | Excavator Type:      | Komatsu PC-120                |
|                           |   | Test Pit Dimensions: | 5.5 ft. x 12 ft.              |

| Depth<br>Scale | Exc.<br>Effort | Strata                           | Soil Description  |
|----------------|----------------|----------------------------------|---|
|                | E              | Topsoil<br>~0.8 ft.              | 0" - 0.8' : Silty SAND (SM), fine, 25-30% fines, trace fine gravel, trace of organic fines, trace roots, dark brown, moist                            |
|                | E              | Fill<br>~3 ft.                   | 0.8' - 3' : Silty SAND with Gravel (SM), fine, trace medium, ~20% fines, 20-25% fine gravel, trace roots, trace wood, trace brick, light brown, moist |
|                | E              |                                  | Encountered ~5% cobbles and boulders up to 1 foot in diameter.  |
| 5 ft           | M              | Sand<br>and<br>Gravel<br>~12 ft. | 3' - 12' : Silty SAND with Gravel (SM), fine, ~15% fines, 15-20% fine gravel, 0-5% cobbles, light brown, moist  |
|                | M              |                                  | Encountered ~5% boulders 1 foot in diameter.  |
|                | M              |                                  |   |
|                | M              |                                  |   |
|                | M              |                                  |   |
| 10 ft          | M              |                                  |   |
|                | M              |                                  |   |
|                | M              |                                  |   |
|                | M              |                                  |   |
|                | M              |                                  | 10.5' - 12' : Silty SAND with Gravel (SM), fine, 15-20% fines, 15-20% fine gravel, orange to light brown, wet   |
| 15 ft          |                |                                  | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.                       |
|                |                |                                  |   |
|                |                |                                  |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.
- Infiltration test was performed at a depth of 3 feet.



|  |                        |
|--|------------------------|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                        |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644 |
| Excavation Subcontractor:  | Date Started:          |
| Excavation Foreman:  | Date Completed:        |
| LGCI Engineer:   | Location:              |
| Ground Surface El:   | Total Depth:           |
| Groundwater Depth:   | Excavator Type:        |
|  | Test Pit Dimensions:   |

| Depth<br>Scale | Exc.<br>Effort | Strata | Soil Description  |
|----------------|----------------|--------|---|
| 5 ft           |                |        | Test pit TP-116 was not performed due to conflicts with water line. |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
| 10 ft          |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
| 15 ft          |                |        |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult



|                           |   |                      |                            |
|---------------------------|---|----------------------|----------------------------|
| Project:                  | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                      |                            |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                      | LGCI Project No.: 1644     |
| Excavation Subcontractor: | Northern Drill Service, Inc.  | Date Started:        | 02/22/18                   |
| Excavation Foreman:       | Dave Edilberti  | Date Completed:      | 02/22/18                   |
| LGCI Engineer:            | Malinda Chea  | Location:            | SE corner of playing field |
| Ground Surface El:        | ~769.7 ft. (see remark 1)   | Total Depth:         | 12 feet                    |
| Groundwater Depth:        | ~10.5 ft. water seeped in   | Excavator Type:      | Komatsu PC-120             |
|                           |   | Test Pit Dimensions: | 3.5 ft. x 13 ft.           |

| Depth<br>Scale | Exc.<br>Effort | Strata            | Soil Description   |
|----------------|----------------|-------------------|--|
|                | E              | Topsoil<br>~1 ft. | 0" - 1' : Silty SAND (SM), fine, 25-30% fines, trace fine gravel, trace of organic fines, trace roots, dark brown, moist   |
|                | E              | Fill<br>~3.5 ft.  | 1' - 3.5' : Silty SAND with Gravel (SM), fine, trace medium, 15-20% fines, 15-20% fines, trace roots, trace wood, light brown, moist   |
|                | M              |                   |  |
|                | M              |                   |  |
| 5 ft           | M              | Sand<br>~12 ft.   | 3.5' - 4' : Silty SAND (SM), fine, ~30% fines, gray, moist<br>4' - 10.5' : Silty SAND with Gravel (SM), fine, 15-20% fines, 15-20% fine gravel, 5-10% cobbles up to 8 inch in diameter, light brown, moist |
|                | M              |                   |  |
|                | M              |                   |  |
|                | M              |                   |  |
|                | M              |                   |  |
|                | M              |                   |  |
|                | M              |                   |  |
|                | M              |                   |  |
| 10 ft          | M              |                   | 10' - 12' : Silty SAND with Gravel (SM), fine, 15-20% fines, 20-25% fine gravel, ~5% cobbles up to 8 inch in diameter, light brown, wet  |
|                | M              |                   |  |
|                | M              |                   |  |
|                | M              |                   |  |
| 15 ft          |                |                   | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.  |
|                |                |                   |  |
|                |                |                   |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.



|  |   |
|--|---|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |   |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644                      |
| Excavation Subcontractor: Northern Drill Service, Inc.                         | Date Started: 02/22/18                      |
| Excavation Foreman: Dave Edilberti   | Date Completed: 02/22/18                    |
| LGCI Engineer: Malinda Chea  | Location: Near SW corner of existing school |
| Ground Surface El: ~774.5 ft. (see remark 1)                                   | Total Depth: 9.5 feet                       |
| Groundwater Depth: NE  | Excavator Type: Komatsu PC-120              |
|  | Test Pit Dimensions: 5 ft. x 12 ft.         |

| Depth Scale | Exc. Effort | Strata           | Soil Description  |
|-------------|-------------|------------------|---|
| 5 ft        | M           | Topsoil ~0.5 ft. | 0" - 0.5' : Silty SAND (SM), fine, 25-30% fines, trace of organic fines, trace roots, dark brown, moist                                   |
|             | D           | Fill             | 0.5' - 9.5' : Silty SAND with Gravel (SM), fine, trace medium, trace coarse, 15-20% fines, 20-25% fine angular gravel, light brown, moist |
|             | D           |                  |   |
|             | D           |                  |   |
|             | M           |                  |   |
|             | M           |                  |   |
|             | M           |                  |   |
|             | M           |                  |   |
|             | M           |                  |   |
|             | M           |                  |   |
|             | M           |                  |   |
| 10 ft       | M           | ~9.5 ft.         | Bottom of test pit at 9.5 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.          |
|             |             |                  |   |
|             |             |                  |   |
|             |             |                  |   |
|             |             |                  |   |
|             |             |                  |   |
| 15 ft       |             |                  |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.
2. Infiltration test was performed at a depth of 3 feet.
3. Encountered a water line at 9.5 feet.





|                           |   |                      |  |
|---------------------------|---|----------------------|--|
| Project:                  | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                      |  |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                      | LGCI Project No.: 1644                       |
| Excavation Subcontractor: | Northern Drill Service, Inc.  | Date Started:        | 02/23/18                                     |
| Excavation Foreman:       | Dave Edilberti  | Date Completed:      | 02/23/18                                     |
| LGCI Engineer:            | Malinda Chea  | Location:            | Bottom of slope south of the existing school |
| Ground Surface El:        | ~783.9 ft. (see remark 1)   | Total Depth:         | 12 feet                                      |
| Groundwater Depth:        | ~1.5 ft. water seeped in  | Excavator Type:      | Komatsu PC-120                               |
|                           |   | Test Pit Dimensions: | 3 ft. x 10 ft.                               |

| Depth<br>Scale | Exc.<br>Effort | Strata            | Soil Description   |
|----------------|----------------|-------------------|--|
|                | E              | Topsoil<br>~1 ft. | 0" - 1' : Silty SAND (SM), fine, ~30% fines, trace of organic fines, trace roots, dark brown, moist  |
|                | M              | Fill<br>~3 ft.    | 1' - 3' : Silty SAND with Gravel (SM), fine, trace medium, ~15% fines, 20-25% fine gravel, light brown, moist                                      |
|                | M              |                   |  |
| 5 ft           | M              |                   | 3' - 6' : Silty SAND (SM) fine, trace medium, 20-25% fines, 5-10% fine gravel, ~5% cobbles up to 6 inch in diameter, light brown, moist            |
|                | M              |                   |  |
|                | M              |                   |  |
| 10 ft          | D              | Sand<br>~12 ft.   | 6' - 12' : Silty SAND (SM), fine, trace medium, trace coarse, 25-30% fines, 5-10% fine gravel, trace cobbles up to 6 inch in diameter, gray, moist |
|                | D              |                   |  |
|                | D              |                   |  |
|                | D              |                   |  |
|                | D              |                   |  |
| 15 ft          |                |                   | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.                    |
|                |                |                   |  |
|                |                |                   |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.



|                           |   |                      |   |
|---------------------------|---|----------------------|---|
| Project:                  | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                      |   |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                      | LGCI Project No.: 1644                      |
| Excavation Subcontractor: | Northern Drill Service, Inc.  | Date Started:        | 02/23/18                                    |
| Excavation Foreman:       | Dave Edilberti  | Date Completed:      | 02/23/18                                    |
| LGCI Engineer:            | Malinda Chea  | Location:            | Island east of the existing school entrance |
| Ground Surface El:        | ~786.8 ft. (see remark 1)   | Total Depth:         | 12 feet                                     |
| Groundwater Depth:        | NE  | Excavator Type:      | Komatsu PC-120                              |
|                           |   | Test Pit Dimensions: | 4 ft. x 13 ft.                              |

| Depth Scale | Exc. Effort | Strata                     | Soil Description  |
|-------------|-------------|----------------------------|---|
| 5 ft        | E           | Topsoil<br>~2.5 ft.        | 0" - 2.5' : Silty SAND (SM), fine, ~30% fines, trace fine gravel, trace of organic fines, trace roots, trace grass, dark brown, moist                                   |
|             | E           |                            |   |
|             | E           |                            |   |
|             | M           | Fill<br>~5 ft.             | 2.5' - 5' : Silty SAND (SM), fine to medium, 40-45% fines, 5-10% fine angular gravel, trace roots, light brown, moist   |
|             | M           |                            |   |
| 10 ft       | M           | Sand and Gravel<br>~12 ft. | 5' - 12' : Silty SAND with Gravel (SM), fine to coarse, 25-30% fines, 20-25% fine to coarse subrounded gravel, ~5% cobbles up to 6 inch in diameter, light brown, moist |
|             | M           |                            |   |
|             | M           |                            |   |
|             | M           |                            |   |
|             | M           |                            |   |
|             | M           |                            |   |
|             | D           |                            | Encountered ~5% boulders up to 1.5 feet in diameter.  |
|             | D           |                            |   |
| 15 ft       |             |                            | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.   |
|             |             |                            |   |
|             |             |                            |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.



|  |  |                      |   |
|--|--|----------------------|---|
| Project:   | Proposed Worcester South High School, Worcester, Massachusetts |                      |   |
| Client:  | Lamoureux Pagano & Associates, Inc.                            |                      | LGCI Project No.: 1644                      |
| Excavation Subcontractor: Northern Drill Service, Inc. |  | Date Started:        | 02/26/18                                    |
| Excavation Foreman: Dave Edilberti                     |  | Date Completed:      | 02/26/18                                    |
| LGCI Engineer: Andrew Jefferson                        |  | Location:            | Island east of the existing school entrance |
| Ground Surface El: ~784.0 ft. (see remark 1)           |  | Total Depth:         | 12 feet                                     |
| Groundwater Depth: NE                                  |  | Excavator Type:      | Komatsu PC-120                              |
|  |  | Test Pit Dimensions: | 6 ft. x 10 ft.                              |

| Depth<br>Scale | Exc.<br>Effort | Strata                     | Soil Description   |
|----------------|----------------|----------------------------|--|
| 5 ft           | E              | Topsoil<br>~2 ft.          | 0" - 2' : Silty SAND (SM), fine to medium, 35-40% fines, trace fine gravel, trace of organic fines, trace roots, leaves, dark brown, moist   |
|                | E              |                            |  |
|                | M              | Fill<br>~3 ft.             | 2.5' - 5' : Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 20-25% fine gravel, ~5% cobbles up to 6 inch in diameter, trace brick, brown, moist   |
|                | D              | Sand and Gravel<br>~12 ft. | 3' - 12' : Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 30-35% fine to coarse subangular gravel, ~5% cobbles/ boulders up to 4 feet in diameter, light brown, moist |
|                | D              |                            |  |
| 10 ft          | D              |                            |  |
|                | D              |                            |  |
|                | D              |                            |  |
|                | D              |                            |  |
|                | D              |                            |  |
| 15 ft          | D              |                            |  |
|                | D              |                            |  |
|                |                |                            | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.  |
|                |                |                            |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.
- Infiltration test was performed at a depth of 3 feet.



|                           |   |                      |                                       |
|---------------------------|---|----------------------|---------------------------------------|
| Project:                  | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                      |                                       |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                      | LGCI Project No.: 1644                |
| Excavation Subcontractor: | Northern Drill Service, Inc.  | Date Started:        | 02/23/18                              |
| Excavation Foreman:       | Dave Edilberti  | Date Completed:      | 02/23/18                              |
| LGCI Engineer:            | Malinda Chea  | Location:            | Lawn east of existing school entrance |
| Ground Surface El:        | ~784.2 ft. (see remark 1)   | Total Depth:         | 8.5 feet                              |
| Groundwater Depth:        | NE  | Excavator Type:      | Komatsu PC-120                        |
|                           |   | Test Pit Dimensions: | 4 ft. x 10 ft.                        |

| Depth<br>Scale | Exc.<br>Effort | Strata   | Soil Description  |
|----------------|----------------|----------|---|
| 5 ft           | E              | Topsoil  | 0" - 1.5' : Silty SAND (SM), fine, 25-30% fines, trace fine gravel, trace of organic fines, trace roots, dark brown, moist  |
|                | E              | ~1.5 ft. |   |
|                | E              | Fill     | 1.5' - 8.5' : Silty SAND with Gravel (SM), fine, trace medium, 15-20% fines, 20-25% fine gravel, ~5% cobbles up to 6 inch in diameter, trace brick, trace concrete, trace construction debris, light brown, moist |
|                | M              |          | Encountered ~5% boulders up to 1.5 feet in diameter.  |
|                | M              |          |   |
|                | M              |          |   |
|                | M              |          |   |
|                | M              |          |   |
| 10 ft          | M              | ~8.5 ft. | Bottom of test pit at 8.5 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.  |
|                |                |          |   |
|                |                |          |   |
|                |                |          |   |
|                |                |          |   |
|                |                |          |   |
|                |                |          |   |
| 15 ft          |                |          |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.
2. Excavator teeth punctured through a water line pipe at 8.5 feet.



|  |                        |
|--|------------------------|
| Project: <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                        |
| Client: <b>Lamoureux Pagano &amp; Associates, Inc.</b>                         | LGCI Project No.: 1644 |
| Excavation Subcontractor:  | Date Started:          |
| Excavation Foreman:  | Date Completed:        |
| LGCI Engineer:   | Location:              |
| Ground Surface El:   | Total Depth:           |
| Groundwater Depth:   | Excavator Type:        |
|  | Test Pit Dimensions:   |

| Depth<br>Scale | Exc.<br>Effort | Strata | Soil Description  |
|----------------|----------------|--------|---|
| 5 ft           |                |        | Test pit TP-123 was not performed due to conflicts with water line. |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
| 10 ft          |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
|                |                |        |   |
| 15 ft          |                |        |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult



|                           |   |                      |                                    |
|---------------------------|---|----------------------|------------------------------------|
| Project:                  | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                      |                                    |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                      | LGCI Project No.: 1644             |
| Excavation Subcontractor: | Northern Drill Service, Inc.  | Date Started:        | 02/22/18                           |
| Excavation Foreman:       | Dave Edilberti  | Date Completed:      | 02/22/18                           |
| LGCI Engineer:            | Malinda Chea  | Location:            | Slope south of the existing school |
| Ground Surface El:        | ~789.7 ft. (see remark 1)   | Total Depth:         | 12 feet                            |
| Groundwater Depth:        | ~5 ft. water seeped in  | Excavator Type:      | Komatsu PC-120                     |
|                           |   | Test Pit Dimensions: | 3 ft. x 11 ft.                     |

| Depth<br>Scale | Exc.<br>Effort | Strata            | Soil Description  |
|----------------|----------------|-------------------|---|
| 5 ft           | E              | Topsoil<br>~1 ft. | 0" - 1' : Silty SAND (SM), fine, 25-30% fines, trace of organic fines, trace roots, dark brown, moist   |
|                | M              | Fill              | 1' - 7' : Silty SAND with Gravel (SM), fine to coarse, 20-25% fines, 30-35% fine to coarse subrounded gravel, 5-10% cobbles up to 8 inch in diameter, trace organic fines, trace brick, trace wood, trace roots, light brown, moist<br><br>Encountered ~5% boulders up to 2 feet in diameter. |
|                | M              |                   |   |
|                | M              |                   |   |
|                | M              |                   |   |
|                | M              |                   |   |
|                | M              |                   |   |
| 10 ft          | D              | Sand              | 7' - 12' : Silty SAND (SM), fine, trace medium, ~30% slightly plastic fines, ~10% fine subrounded gravel, brown to gray, moist  |
|                | D              |                   |   |
|                | D              |                   |   |
|                | D              |                   |   |
|                | D              |                   |   |
|                | D              |                   |   |
| 15 ft          |                | ~12 ft.           | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.   |
|                |                |                   |   |
|                |                |                   |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.
- Observed a boulder with a diameter of 6.5 feet embedded in the surface at the side of the test pit.



|                           |   |                      |                                    |
|---------------------------|---|----------------------|------------------------------------|
| Project:                  | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                      |                                    |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                      | LGCI Project No.: 1644             |
| Excavation Subcontractor: | Northern Drill Service, Inc.  | Date Started:        | 02/22/18                           |
| Excavation Foreman:       | Dave Edilberti  | Date Completed:      | 02/22/18                           |
| LGCI Engineer:            | Malinda Chea  | Location:            | Slope south of the existing school |
| Ground Surface El:        | ~789.5 ft. (see remark 1)   | Total Depth:         | 12.5 feet                          |
| Groundwater Depth:        | ~1.5 ft. water seeped in  | Excavator Type:      | Komatsu PC-120                     |
|                           |   | Test Pit Dimensions: | 2.5 ft. x 14 ft.                   |

| Depth<br>Scale | Exc.<br>Effort | Strata    | Soil Description  |
|----------------|----------------|-----------|---|
| 5 ft           | E              | Topsoil   | 0" - 1.5' : Silty SAND (SM), fine, 25-30% fines, trace of organic fines, trace roots, dark brown, moist                             |
|                | E              | ~1.5 ft.  |   |
|                | E              |           | 1.5' - 3' : Silty SAND (SM), fine, trace medium, ~15% fines, 5-10% fine gravel, light brown, wet                                    |
|                | M              |           | 3' - 7' : Silty SAND with Gravel (SM), fine, ~30% fines, 20-25% fine gravel, brown to gray, moist                                   |
|                | M              |           |   |
| 10 ft          | M              |           |   |
|                | M              |           |   |
|                | D              | Sand      | 7' - 12.5' : Silty SAND (SM), fine, trace medium, 20-25% fines, gray, moist<br>Encountered ~5% boulders up to 1.5 feet in diameter. |
|                | D              |           |   |
|                | D              |           |   |
| 15 ft          | D              | ~12.5 ft. |   |
|                |                |           | Bottom of test pit at 12.5 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.   |
|                |                |           |   |
|                |                |           |   |
|                |                |           |   |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.



|                           |   |                      |  |
|---------------------------|---|----------------------|--|
| Project:                  | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                      |  |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                      | LGCI Project No.: 1644                     |
| Excavation Subcontractor: | Northern Drill Service, Inc.  | Date Started:        | 02/26/18                                   |
| Excavation Foreman:       | Dave Edilberti  | Date Completed:      | 02/26/18                                   |
| LGCI Engineer:            | Malinda Chea  | Location:            | Wooded area at NE corner of athletic field |
| Ground Surface El:        | ~761.9 ft. (see remark 1)   | Total Depth:         | 12 feet                                    |
| Groundwater Depth:        | NE  | Excavator Type:      | Komatsu PC-120                             |
|                           |   | Test Pit Dimensions: | 5 ft. x 10.3 ft.                           |

| Depth Scale | Exc. Effort | Strata  | Soil Description   |
|-------------|-------------|---------|--|
| 5 ft        | E           | Topsoil | 0" - 2.8' : Silty SAND (SM), fine, ~30% fines, trace fine gravel, trace of organic fines, trace roots, trace grass, dark brown, moist                            |
|             | E           |         |  |
|             | M           |         |  |
|             | M           | Subsoil | 2.8' - 5.8' : Silty SAND with Gravel (SM), fine, 20-25% fines, ~20% fine gravel, trace of organic fines, trace roots, orange to brown, moist                     |
|             | M           |         |  |
|             | M           |         |  |
| 10 ft       | M           | Sand    | 5.8' - 12' : Silty SAND with Gravel (SM), fine, trace medium, ~15% fines, 30-35% fine to coarse gravel, ~5% cobbles up to 6 inch in diameter, light brown, moist |
|             | M           |         | Encountered ~5% boulders up to 1.5 feet in diameter from 6 feet to 10 feet.  |
|             | M           |         |  |
|             | M           |         |  |
|             | D           |         | Encountered ~10% boulders up to 3.5 feet in diameter from 10 feet to 12 feet.  |
|             | D           |         |  |
|             | D           |         |  |
|             | D           |         |  |
|             |             |         | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.                                  |
|             |             |         |  |
|             |             |         |  |
| 15 ft       |             |         |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.
2. The test pit was terminated at a depth of 12 feet due to encountering a large boulder that was difficult to remove.





|                           |   |                      |   |
|---------------------------|---|----------------------|---|
| Project:                  | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                      |   |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                      | LGCI Project No.: 1644                      |
| Excavation Subcontractor: | Northern Drill Service, Inc.  | Date Started:        | 02/23/18                                    |
| Excavation Foreman:       | Dave Edilberti  | Date Completed:      | 02/23/18                                    |
| LGCI Engineer:            | Malinda Chea  | Location:            | Wooded area east of northern athletic field |
| Ground Surface El:        | ~749.0 ft. (see remark 1)   | Total Depth:         | 12 feet                                     |
| Groundwater Depth:        | NE  | Excavator Type:      | Komatsu PC-120                              |
|                           |   | Test Pit Dimensions: | 8 ft. x 9.3 ft.                             |

| Depth<br>Scale | Exc.<br>Effort | Strata              | Soil Description   |
|----------------|----------------|---------------------|--|
| 5 ft           | E              | Topsoil<br>~0.5 ft. | 0" - 0.5' : Silty SAND (SM), fine, ~30% fines, trace fine gravel, trace of organic fines, trace roots, trace grass, dark brown, moist                    |
|                | M              | Subsoil             | 0.5' - 2.5' : Silty SAND with Gravel (SM), fine, trace medium, 20-25% fines, ~20% fine to coarse gravel, trace of organic fines, trace roots, tan, moist |
|                | M              | ~2.5 ft.            |  |
|                | D              | Sand and Gravel     | 2.5' - 12' : Silty SAND with Gravel (SM), fine, trace medium, 15-20% fines, 15-20% fine gravel, 5-10% cobbles, light brown, moist                        |
|                | D              |                     | Encountered ~5% boulders up to 3 feet in diameter from 3 feet to 8 feet.   |
| 10 ft          | D              |                     |  |
|                | D              |                     |  |
|                | D              |                     |  |
|                | D              |                     |  |
| 15 ft          | M              |                     |  |
|                | M              |                     |  |
|                | M              |                     |  |
|                | M              |                     |  |
|                | M              | ~12 ft.             |  |
|                |                |                     | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.                          |
|                |                |                     |  |
|                |                |                     |  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1. Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.
2. The topsoil layer may not be representative as the area was cleared of trees before the test pit was excavated.



|                           |   |                      |   |
|---------------------------|---|----------------------|---|
| Project:                  | <b>Proposed Worcester South High School, Worcester, Massachusetts</b> |                      |   |
| Client:                   | <b>Lamoureux Pagano &amp; Associates, Inc.</b>                        |                      | LGCI Project No.: 1644                      |
| Excavation Subcontractor: | Northern Drill Service, Inc.  | Date Started:        | 02/23/18                                    |
| Excavation Foreman:       | Dave Edilberti  | Date Completed:      | 02/23/18                                    |
| LGCI Engineer:            | Malinda Chea  | Location:            | Wooded area east of northern athletic field |
| Ground Surface El:        | ~751.4 ft. (see remark 1)   | Total Depth:         | 12 feet                                     |
| Groundwater Depth:        | NE  | Excavator Type:      | Komatsu PC-120                              |
|                           |   | Test Pit Dimensions: | 3 ft. x 10 ft.                              |

| Depth<br>Scale | Exc.<br>Effort | Strata          | Soil Description   |
|----------------|----------------|-----------------|--|
|                | E              | Topsoil         | 0" - 1.5' : Silty SAND (SM), fine, 25-30% fines, trace fine gravel, trace of organic fines, trace roots, dark brown, moist   |
|                | M              | ~1.5 ft.        |  |
|                | M              | Subsoil         | 1.5' - 3.3' : Silty SAND (SM), fine, 20-25% fines, 5-10% fine gravel, trace of organic fines, trace roots, tan, moist  |
|                | D              | ~3.3 ft.        |  |
| 5 ft           | D              | Sand and Gravel | 3.3' - 12' : Silty SAND with Gravel (SM), fine, trace medium, 15-20% fines, ~15% fine subrounded gravel, ~5% cobbles up to 6 inch in diameter, trace boulders up to 1 foot in diameter, light brown, moist |
|                | D              |                 |  |
|                | D              |                 |  |
|                | D              |                 |  |
| 10 ft          | M              |                 |  |
|                | M              |                 |  |
|                | M              |                 |  |
|                | M              |                 |  |
| 15 ft          |                |                 |  |
|                |                |                 |  |
|                |                |                 |  |
|                |                |                 |  |
|                |                |                 | Bottom of test pit at 12 feet. Backfilled test pit with excavated material in 1 foot lifts and compacted with excavator bucket.  |

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

- Ground surface elevation provided in a drawing titled: "Boring Location Plan, South High Community School, Worcester, Massachusetts," and dated February 12, 2018. Drawing provided to LGCI from Nitsch Engineering, Inc. via email on February 12, 2018.
- The topsoil layer may not be representative as the area was cleared of trees before the test pit was excavated.

## **APPENDIX D – Double Ring Infiltrometer Tests**

## Double Ring Infiltrometer Test

**Project:** Name: Proposed Worcester South High School  
 Location: Worcester, MA  
 LGCI Project Number: 1644

**Test Location:** TP-101-IT

**Test Procedure:** General accordance with ASTM D 3385

**Test Date** 2/13/2018

**LGCI Representative:** Andrew Jefferson

**Weather Conditions:** Sunny, 35 degrees

**Test Depth:** 3 feet

**Groundwater Depth:** NA

**Soil Stratum:** Silty SAND with Gravel (SM), fine to coarse, 30-35% fines, 15-20% fine to coarse subangular gravel, light brown, moist

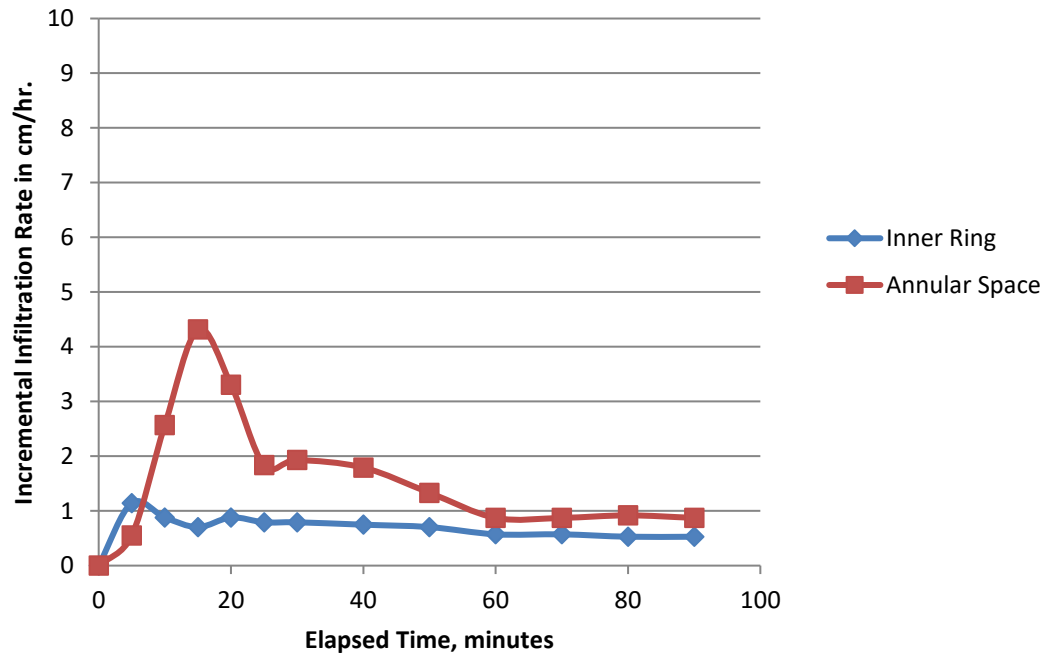
|                         | Inner Ring | Annular Space |
|-------------------------|------------|---------------|
| Area (sq. cm)           | 730        | 2189          |
| Depth Driven (in)       | 4          | 6             |
| Water Depth (in)        | 3          | 3             |
| Mariotte tube (cc/div.) | 53.52      | 167.53        |

| Elapsed Time | Time Increment | Inner Ring |        |                   | Annular Space |        |                   |
|--------------|----------------|------------|--------|-------------------|---------------|--------|-------------------|
|              |                | Reading    | Volume | Infiltration Rate | Reading       | Volume | Infiltration Rate |
| (min)        | (min)          | (div)      | (cc)   | (cm/hr.)          | (div)         | (cc)   | (cm/hr.)          |
| 0            | 0              | 58         | 0      | 0                 | 58.0          | 0      | 0                 |
| 5            | 5              | 56.7       | 70     | 1.1               | 57.4          | 101    | 0.6               |
| 10           | 5              | 55.7       | 54     | 0.9               | 54.6          | 469    | 2.6               |
| 15           | 5              | 54.9       | 43     | 0.7               | 49.9          | 787    | 4.3               |
| 20           | 5              | 53.9       | 54     | 0.9               | 46.3          | 603    | 3.3               |
| 25           | 5              | 53         | 48     | 0.8               | 44.3          | 335    | 1.8               |
| 30           | 5              | 52.1       | 48     | 0.8               | 42.2          | 352    | 1.9               |
| 40           | 10             | 50.4       | 91     | 0.7               | 38.3          | 653    | 1.8               |
| 50           | 10             | 48.8       | 86     | 0.7               | 35.4          | 486    | 1.3               |
| 60           | 10             | 47.5       | 70     | 0.6               | 33.5          | 318    | 0.9               |
| 70           | 10             | 46.2       | 70     | 0.6               | 31.6          | 318    | 0.9               |
| 80           | 10             | 45         | 64     | 0.5               | 29.6          | 335    | 0.9               |
| 90           | 10             | 43.8       | 64     | 0.5               | 27.7          | 318    | 0.9               |

Notes:

1. Began saturation at about 1:15 PM and began test at 1:45 PM.

### TP-101, depth = 3 feet



## Double Ring Infiltrometer Test

**Project:** Name: Proposed Worcester South High School  
 Location: Worcester, MA  
 LGCI Project Number: 1644

**Test Location:** TP-105-IT

**Test Procedure:** General accordance with ASTM D 3385

**Test Date** 2/14/2018

**LGCI Representative:** Andrew Jefferson

**Weather Conditions:** Sunny, 40 degrees

**Test Depth:** 34 inches

**Groundwater Depth:** NA

**Soil Stratum:** Silty SAND with Gravel (SM), fine, ~20% fines, 20-25% fine to coarse gravel, 5-10% cobbles, trace roots, light brown, moist (fill)

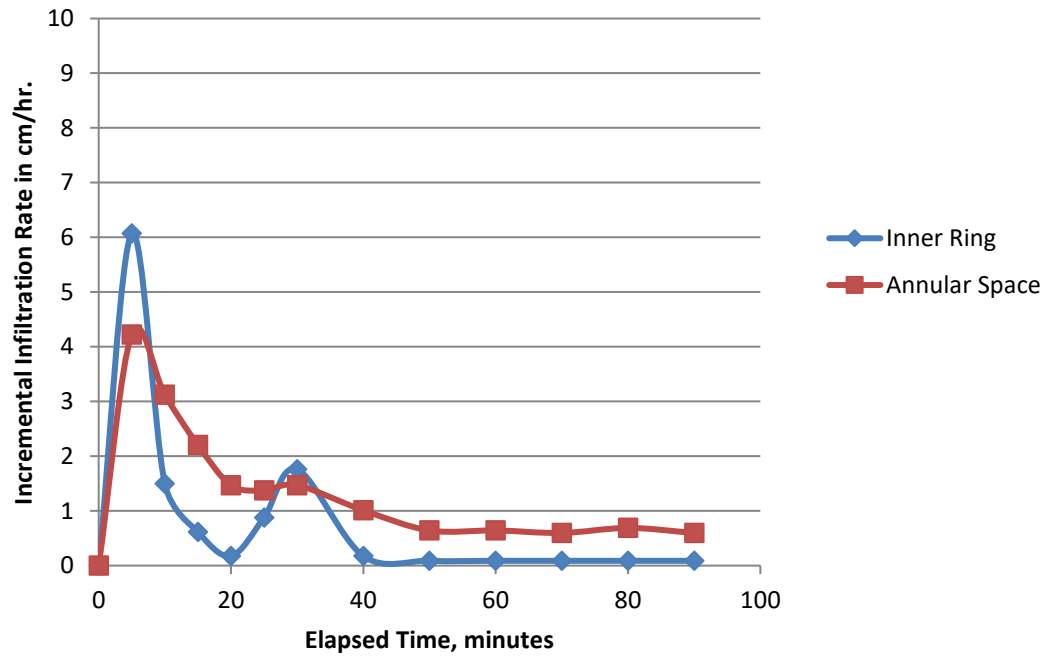
|                         |       |         |
|-------------------------|-------|---------|
|                         | Inner | Annular |
|                         | Ring  | Space   |
| Area (sq. cm)           | 730   | 2189    |
| Depth Driven (in)       | 3     | 5       |
| Water Depth (in)        | 3     | 3       |
| Mariotte tube (cc/div.) | 53.52 | 167.53  |

| Elapsed Time | Time Increment | Inner Ring |        |                   | Annular Space |        |                   |
|--------------|----------------|------------|--------|-------------------|---------------|--------|-------------------|
|              |                | Reading    | Volume | Infiltration Rate | Reading       | Volume | Infiltration Rate |
| (min)        | (min)          | (div)      | (cc)   | (cm/hr)           | (div)         | (cc)   | (cm/hr)           |
| 0            | 0              | 57         | 0      | 0                 | 57.0          | 0      | 0                 |
| 5            | 5              | 50.1       | 369    | 6.1               | 52.4          | 771    | 4.2               |
| 10           | 5              | 48.4       | 91     | 1.5               | 49.0          | 570    | 3.1               |
| 15           | 5              | 47.7       | 37     | 0.6               | 46.6          | 402    | 2.2               |
| 20           | 5              | 47.5       | 11     | 0.2               | 45.0          | 268    | 1.5               |
| 25           | 5              | 46.5       | 54     | 0.9               | 43.5          | 251    | 1.4               |
| 30           | 5              | 44.5       | 107    | 1.8               | 41.9          | 268    | 1.5               |
| 40           | 10             | 44.1       | 21     | 0.2               | 39.7          | 369    | 1.0               |
| 50           | 10             | 43.9       | 11     | 0.1               | 38.3          | 235    | 0.6               |
| 60           | 10             | 43.7       | 11     | 0.1               | 36.9          | 235    | 0.6               |
| 70           | 10             | 43.5       | 11     | 0.1               | 35.6          | 218    | 0.6               |
| 80           | 10             | 43.3       | 11     | 0.1               | 34.1          | 251    | 0.7               |
| 90           | 10             | 43.1       | 11     | 0.1               | 32.8          | 218    | 0.6               |

**Notes:**

1. Began saturation at 1:30 PM and began test at 1:45 PM.

# TP-105, depth = 2.8 feet



## Double Ring Infiltrometer Test

**Project:** Name: Proposed Worcester South High School  
 Location: Worcester, MA  
 LGCI Project Number: 1644

**Test Location:** TP-115-IT

**Test Procedure:** General accordance with ASTM D 3385

**Test Date** 2/22/2018

**LGCI Representative:** Andrew Jefferson

**Weather Conditions:** Cloudy / 30

**Test Depth:** 3 feet

**Groundwater Depth:** NA

**Soil Stratum:** Silty SAND with Gravel (SM), fine, ~15% fines, 15-20% fine gravel, 0-5% cobble  
 light brown, moist (natural)

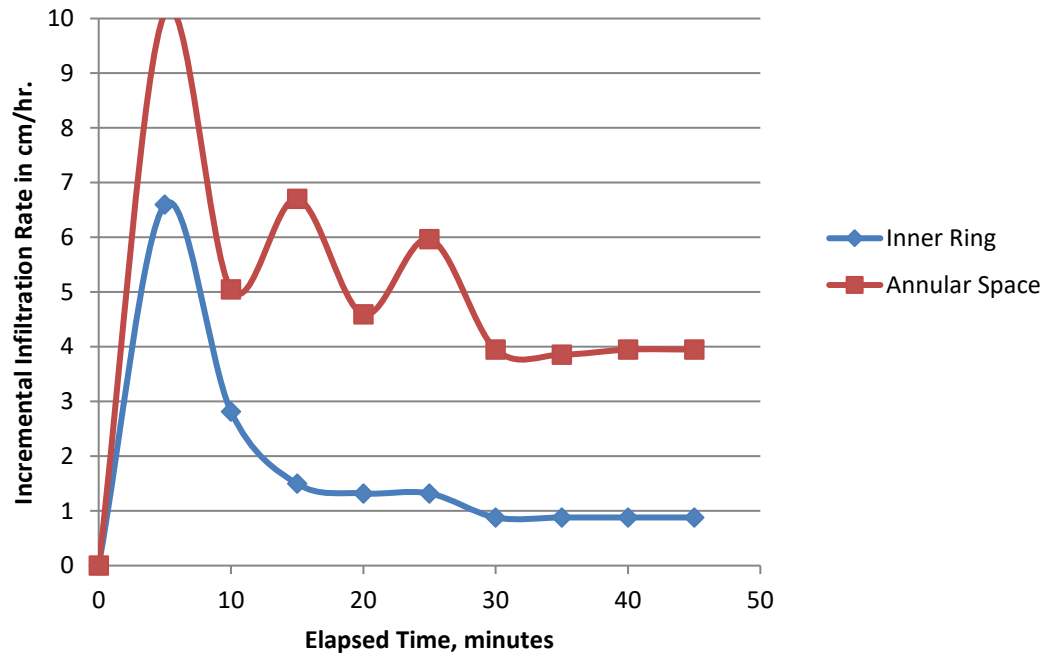
|                         |       |         |
|-------------------------|-------|---------|
|                         | Inner | Annular |
|                         | Ring  | Space   |
| Area (sq. cm)           | 730   | 2189    |
| Depth Driven (in)       | 1     | 1       |
| Water Depth (in)        | 3     | 3       |
| Mariotte tube (cc/div.) | 53.52 | 167.53  |

| Elapsed Time | Time Increment | Inner Ring |        |                   | Annular Space |        |                   |
|--------------|----------------|------------|--------|-------------------|---------------|--------|-------------------|
|              |                | Reading    | Volume | Infiltration Rate | Reading       | Volume | Infiltration Rate |
| (min)        | (min)          | (div)      | (cc)   | (cm/hr)           | (div)         | (cc)   | (cm/hr)           |
| 0            | 0              | 56         | 0      | 0                 | 56.5          | 0      | 0                 |
| 5            | 5              | 48.5       | 401    | 6.6               | 45.5          | 1843   | 10.1              |
| 10           | 5              | 45.3       | 171    | 2.8               | 40.0          | 921    | 5.1               |
| 15           | 5              | 43.6       | 91     | 1.5               | 32.7          | 1223   | 6.7               |
| 20           | 5              | 42.1       | 80     | 1.3               | 27.7          | 838    | 4.6               |
| 25           | 5              | 40.6       | 80     | 1.3               | 21.2          | 1089   | 6.0               |
| 30           | 5              | 39.6       | 54     | 0.9               | 16.9          | 720    | 3.9               |
| 35           | 5              | 38.6       | 54     | 0.9               | 12.7          | 704    | 3.9               |
| 40           | 5              | 37.6       | 54     | 0.9               | 8.4           | 720    | 3.9               |
| 45           | 5              | 36.6       | 54     | 0.9               | 4.1           | 720    | 3.9               |

Notes:



### TP-105, depth = 2.8 feet



## Double Ring Infiltrometer Test

**Project:** Name: Proposed Worcester South High School  
 Location: Worcester, MA  
 LGCI Project Number: 1644

**Test Location:** TP-118-IT

**Test Procedure:** General accordance with ASTM D 3385

**Test Date** 2/22/2018

**LGCI Representative:** Andrew Jefferson

**Weather Conditions:** Cloudy / 30

**Test Depth:** 3 feet

**Groundwater Depth:** NA

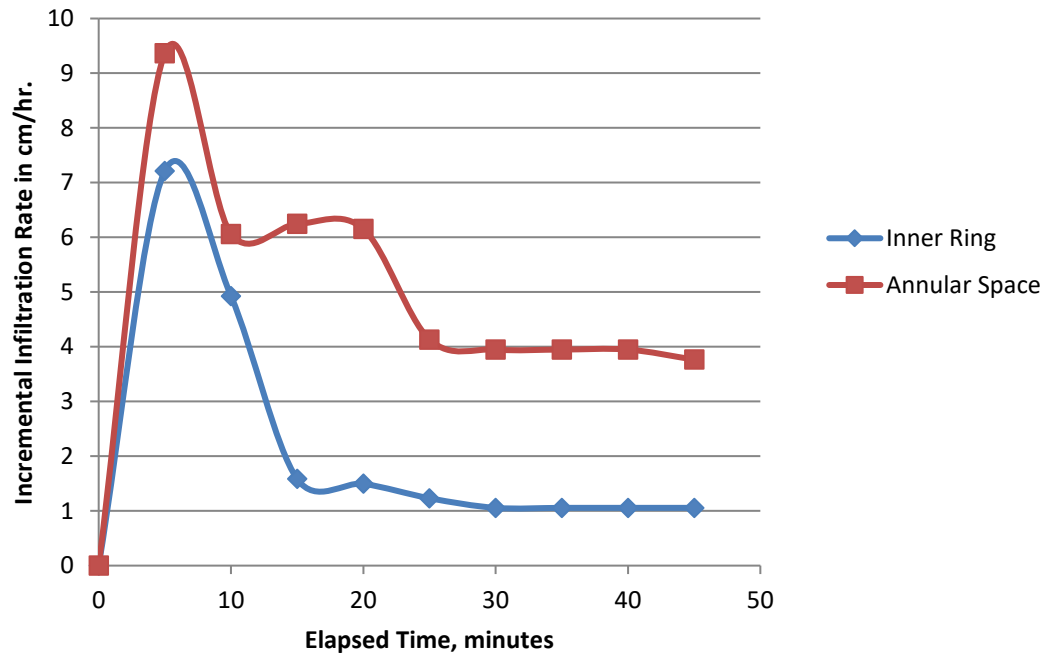
**Soil Stratum:** Silty SAND with Gravel (SM), fine, trace medium, trace coarse, 15-20% fines, 20-25% fine angular (fill)gravel, light brown, moist

|                         |       |         |
|-------------------------|-------|---------|
|                         | Inner | Annular |
|                         | Ring  | Space   |
| Area (sq. cm)           | 730   | 2189    |
| Depth Driven (in)       | 1     | 1       |
| Water Depth (in)        | 3     | 3       |
| Mariotte tube (cc/div.) | 53.52 | 167.53  |

| Elapsed Time | Time Increment | Inner Ring |        |              | Annular Space |        |              |
|--------------|----------------|------------|--------|--------------|---------------|--------|--------------|
|              |                | Reading    | Volume | Infiltration | Reading       | Volume | Infiltration |
| (min)        | (min)          | (div)      | (cc)   | (cm/hr)      | (div)         | (cc)   | (cm/hr)      |
| 0            | 0              | 55.5       | 0      | 0            | 56.5          | 0      | 0            |
| 5            | 5              | 47.3       | 439    | 7.2          | 46.3          | 1709   | 9.4          |
| 10           | 5              | 41.7       | 300    | 4.9          | 39.7          | 1106   | 6.1          |
| 15           | 5              | 39.9       | 96     | 1.6          | 32.9          | 1139   | 6.2          |
| 20           | 5              | 38.2       | 91     | 1.5          | 26.2          | 1122   | 6.2          |
| 25           | 5              | 36.8       | 75     | 1.2          | 21.7          | 754    | 4.1          |
| 30           | 5              | 35.6       | 64     | 1.1          | 17.4          | 720    | 3.9          |
| 35           | 5              | 34.4       | 64     | 1.1          | 13.1          | 720    | 3.9          |
| 40           | 5              | 33.2       | 64     | 1.1          | 8.8           | 720    | 3.9          |
| 45           | 5              | 32         | 64     | 1.1          | 4.7           | 687    | 3.8          |

Notes:

### TP-105, depth = 2.8 feet



## Double Ring Infiltrometer Test

**Project:** Name: Proposed Worcester South High School  
 Location: Worcester, MA  
 LGCI Project Number: 1644

**Test Location:** TP-121-IT

**Test Procedure:** General accordance with ASTM D 3385

**Test Date** 2/26/2018

**LGCI Representative:** Andrew Jefferson

**Weather Conditions:** Sunny / 40

**Test Depth:** 4 feet

**Groundwater Depth:** NA

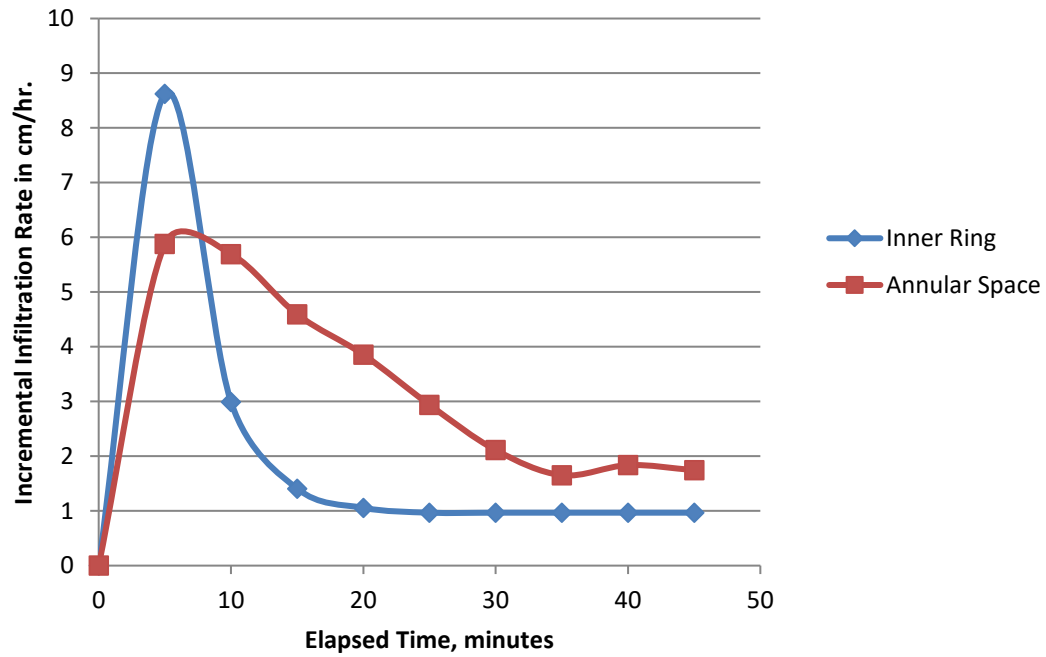
**Soil Stratum:** Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 30-35% fine to coarse gravel, ~5% cobbles/boulders, light brown, moist (natural)

|                         |       |         |
|-------------------------|-------|---------|
|                         | Inner | Annular |
|                         | Ring  | Space   |
| Area (sq. cm)           | 730   | 2189    |
| Depth Driven (in)       | 2     | 2       |
| Water Depth (in)        | 3     | 3       |
| Mariotte tube (cc/div.) | 53.52 | 167.53  |

| Elapsed Time | Time Increment | Inner Ring |        |                   | Annular Space |        |                   |
|--------------|----------------|------------|--------|-------------------|---------------|--------|-------------------|
|              |                | Reading    | Volume | Infiltration Rate | Reading       | Volume | Infiltration Rate |
| (min)        | (min)          | (div)      | (cc)   | (cm/hr)           | (div)         | (cc)   | (cm/hr)           |
| 0            | 0              | 57         | 0      | 0                 | 57.0          | 0      | 0                 |
| 5            | 5              | 47.2       | 524    | 8.6               | 50.6          | 1072   | 5.9               |
| 10           | 5              | 43.8       | 182    | 3.0               | 44.4          | 1039   | 5.7               |
| 15           | 5              | 42.2       | 86     | 1.4               | 39.4          | 838    | 4.6               |
| 20           | 5              | 41         | 64     | 1.1               | 35.2          | 704    | 3.9               |
| 25           | 5              | 39.9       | 59     | 1.0               | 32.0          | 536    | 2.9               |
| 30           | 5              | 38.8       | 59     | 1.0               | 29.7          | 385    | 2.1               |
| 35           | 5              | 37.7       | 59     | 1.0               | 27.9          | 302    | 1.7               |
| 40           | 5              | 36.6       | 59     | 1.0               | 25.9          | 335    | 1.8               |
| 45           | 5              | 35.5       | 59     | 1.0               | 24.0          | 318    | 1.7               |
| 50           | 5              | 34.4       | 59     | 1.0               | 21.9          | 352    | 1.9               |
| 55           | 5              | 33.3       | 59     | 1.0               | 19.9          | 335    | 1.8               |
| 60           | 5              | 32.2       | 59     | 1.0               | 18.0          | 318    | 1.7               |

Notes:

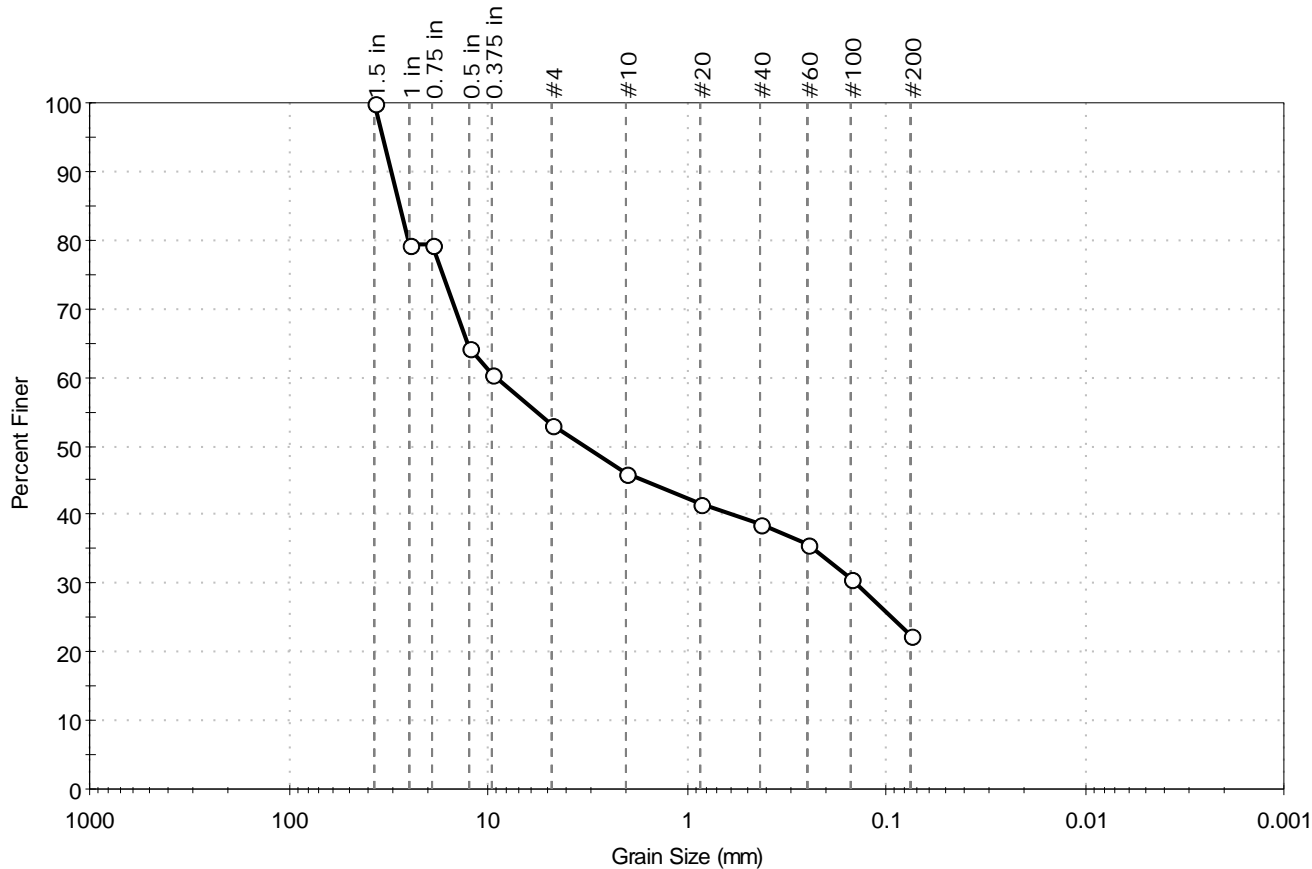
### TP-105, depth = 2.8 feet



## **APPENDIX E - Laboratory Test Results**

|                     |  |              |            |
|---------------------|--|--------------|------------|
| Client:             | Lahlaf Geotechnical Consulting                     |              |            |
| Project:            | Prop. Worcester South HS                           |              |            |
| Location:           | Winchester, MA                                     | Project No:  | GTX-306885 |
| Boring ID:          | B-5  | Sample Type: | jar        |
| Sample ID:          | S2   | Test Date:   | 08/24/17   |
| Depth :             | 2-4  | Test Id:     | 421309     |
| Test Comment:       | ---  |              |            |
| Visual Description: | Moist, dark yellowish brown silty gravel with sand |              |            |
| Sample Comment:     | ---  |              |            |

## Particle Size Analysis - ASTM D422



| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|----------|----------|--------|--------------------|
| ---      | 47.0     | 30.6   | 22.4               |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|------------|----------------|---------------|---------------|----------|
| 1.5 in     | 37.50          | 100           |               |          |
| 1 in       | 25.00          | 79            |               |          |
| 0.75 in    | 19.00          | 79            |               |          |
| 0.5 in     | 12.50          | 64            |               |          |
| 0.375 in   | 9.50           | 61            |               |          |
| #4         | 4.75           | 53            |               |          |
| #10        | 2.00           | 46            |               |          |
| #20        | 0.85           | 42            |               |          |
| #40        | 0.42           | 39            |               |          |
| #60        | 0.25           | 36            |               |          |
| #100       | 0.15           | 31            |               |          |
| #200       | 0.075          | 22            |               |          |
|            |                |               |               |          |
|            |                |               |               |          |

### Coefficients

$D_{85} = 27.9111 \text{ mm}$        $D_{30} = 0.1422 \text{ mm}$   
 $D_{60} = 9.0575 \text{ mm}$        $D_{15} = \text{N/A}$   
 $D_{50} = 3.2455 \text{ mm}$        $D_{10} = \text{N/A}$   
 $C_u = \text{N/A}$        $C_c = \text{N/A}$

### Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

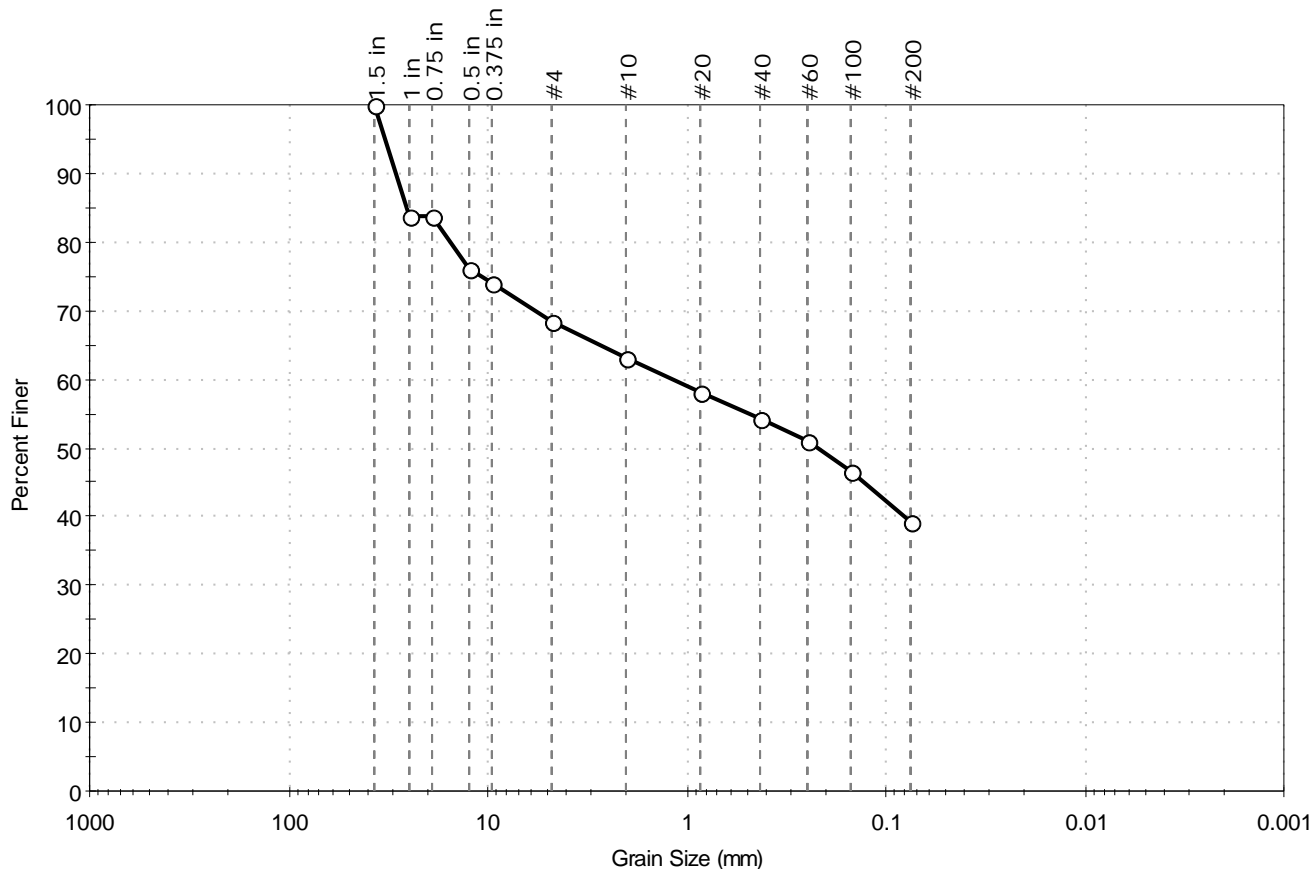
### Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR  
 Sand/Gravel Hardness : HARD



|                     |   |              |            |
|---------------------|---|--------------|------------|
| Client:             | Lahlaf Geotechnical Consulting              | Project No:  | GTX-306885 |
| Project:            | Prop. Worcester South HS                    |              |            |
| Location:           | Winchester, MA                              |              |            |
| Boring ID:          | B-7   | Sample Type: | jar        |
| Sample ID:          | S2  | Test Date:   | 08/24/17   |
| Depth :             | 2-4   | Test Id:     | 421310     |
| Test Comment:       | ---   |              |            |
| Visual Description: | Moist, grayish brown silty gravel with sand |              |            |
| Sample Comment:     | ---   |              |            |

## Particle Size Analysis - ASTM D422



| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|----------|----------|--------|--------------------|
| ---      | 31.5     | 29.4   | 39.1               |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|------------|----------------|---------------|---------------|----------|
| 1.5 in     | 37.50          | 100           |               |          |
| 1 in       | 25.00          | 84            |               |          |
| 0.75 in    | 19.00          | 84            |               |          |
| 0.5 in     | 12.50          | 76            |               |          |
| 0.375 in   | 9.50           | 74            |               |          |
| #4         | 4.75           | 68            |               |          |
| #10        | 2.00           | 63            |               |          |
| #20        | 0.85           | 58            |               |          |
| #40        | 0.42           | 54            |               |          |
| #60        | 0.25           | 51            |               |          |
| #100       | 0.15           | 47            |               |          |
| #200       | 0.075          | 39            |               |          |
|            |                |               |               |          |
|            |                |               |               |          |

### Coefficients

|                              |                       |
|------------------------------|-----------------------|
| D <sub>85</sub> = 25.8594 mm | D <sub>30</sub> = N/A |
| D <sub>60</sub> = 1.1725 mm  | D <sub>15</sub> = N/A |
| D <sub>50</sub> = 0.2206 mm  | D <sub>10</sub> = N/A |
| C <sub>u</sub> = N/A         | C <sub>c</sub> = N/A  |

### Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

### Sample/Test Description

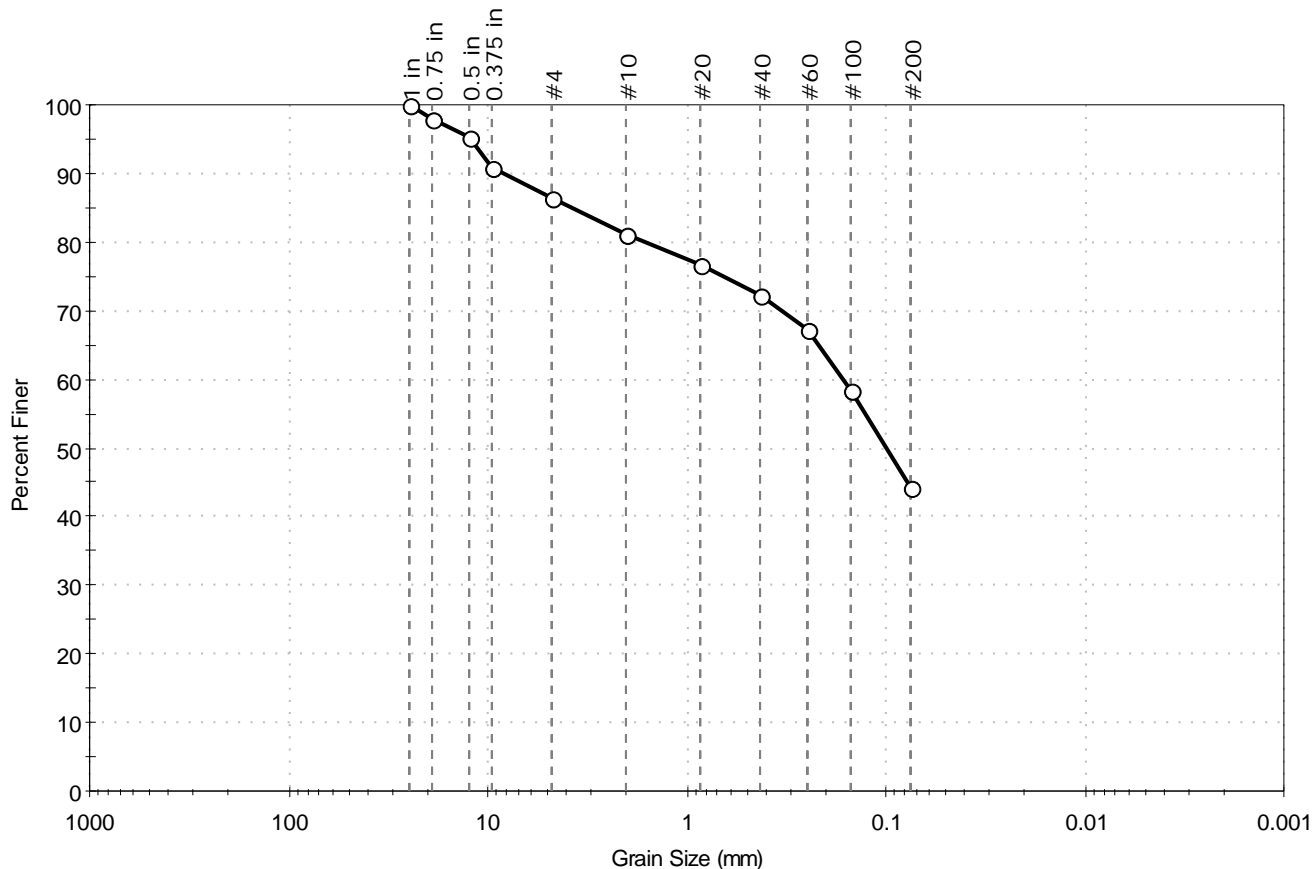
Sand/Gravel Particle Shape : ANGULAR  
Sand/Gravel Hardness : HARD





|                     |                                |              |          |             |            |
|---------------------|--------------------------------|--------------|----------|-------------|------------|
| Client:             | Lahlaf Geotechnical Consulting |              |          |             |            |
| Project:            | Prop. Worcester South HS       |              |          |             |            |
| Location:           | Winchester, MA                 |              |          | Project No: | GTX-306885 |
| Boring ID:          | B-8                            | Sample Type: | jar      | Tested By:  | jbr        |
| Sample ID:          | S2                             | Test Date:   | 08/24/17 | Checked By: | emm        |
| Depth :             | 2-4                            | Test Id:     | 421312   |             |            |
| Test Comment:       | ---                            |              |          |             |            |
| Visual Description: | Moist, olive gray clayey sand  |              |          |             |            |
| Sample Comment:     | ---                            |              |          |             |            |

## Particle Size Analysis - ASTM D422



| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|----------|----------|--------|--------------------|
| ---      | 13.4     | 42.4   | 44.2               |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|------------|----------------|---------------|---------------|----------|
| 1 in       | 25.00          | 100           |               |          |
| 0.75 in    | 19.00          | 98            |               |          |
| 0.5 in     | 12.50          | 95            |               |          |
| 0.375 in   | 9.50           | 91            |               |          |
| #4         | 4.75           | 87            |               |          |
| #10        | 2.00           | 81            |               |          |
| #20        | 0.85           | 77            |               |          |
| #40        | 0.42           | 72            |               |          |
| #60        | 0.25           | 67            |               |          |
| #100       | 0.15           | 58            |               |          |
| #200       | 0.075          | 44            |               |          |
|            |                |               |               |          |
|            |                |               |               |          |

### Coefficients

|                             |                       |
|-----------------------------|-----------------------|
| D <sub>85</sub> = 3.6908 mm | D <sub>30</sub> = N/A |
| D <sub>60</sub> = 0.1640 mm | D <sub>15</sub> = N/A |
| D <sub>50</sub> = 0.0994 mm | D <sub>10</sub> = N/A |
| C <sub>u</sub> = N/A        | C <sub>c</sub> = N/A  |

### Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

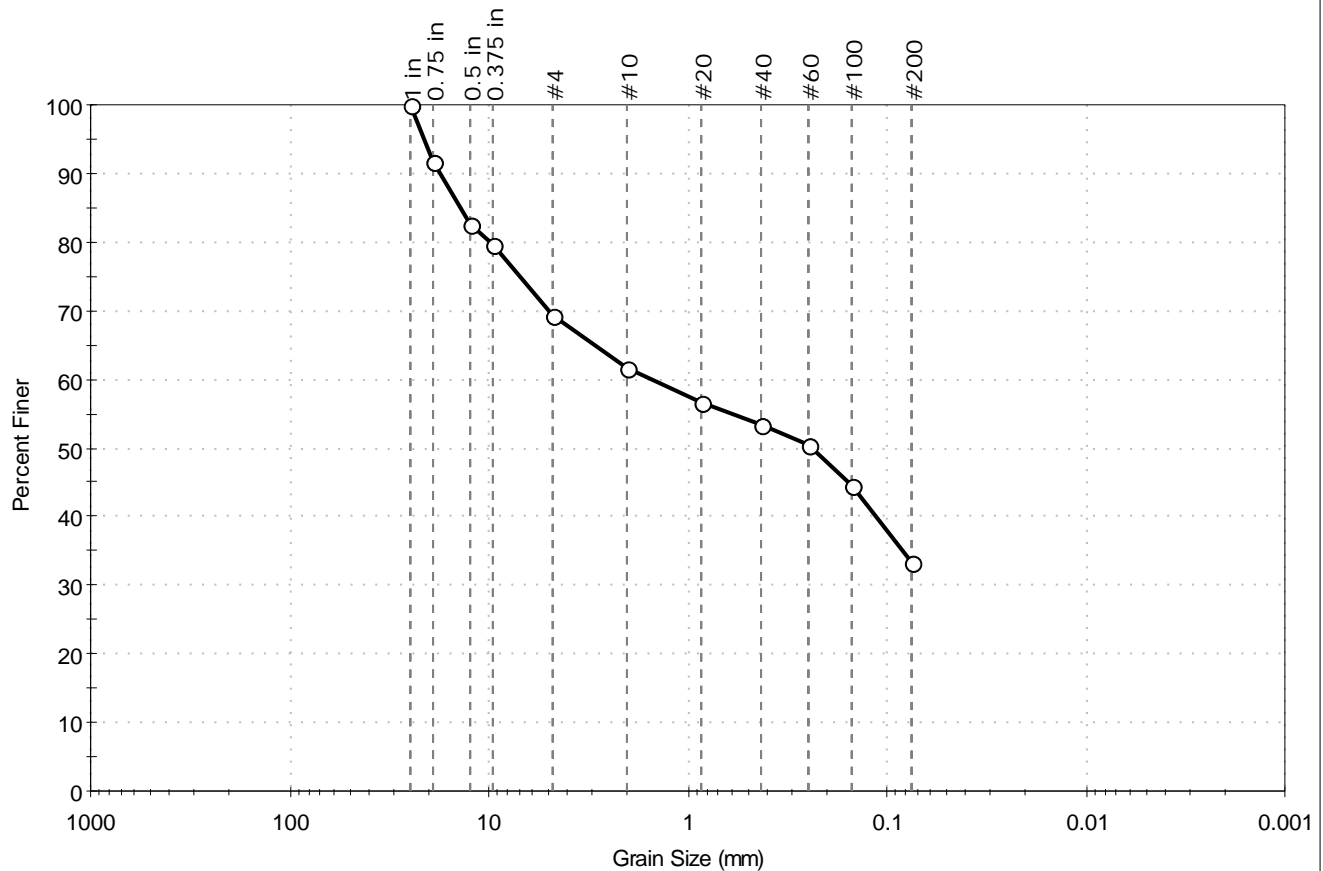
### Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR  
Sand/Gravel Hardness : HARD



|                     |   |              |            |
|---------------------|---|--------------|------------|
| Client:             | Lahlaf Geotechnical Consulting            | Project No:  | GTX-306885 |
| Project:            | Prop. Worcester South HS                  |              |            |
| Location:           | Winchester, MA                            |              |            |
| Boring ID:          | B-8                                       | Sample Type: | jar        |
| Sample ID:          | S3  | Test Date:   | 08/24/17   |
| Depth :             | 4-6                                       | Test Id:     | 421311     |
| Test Comment:       | ---                                       |              |            |
| Visual Description: | Moist, olive gray clayey sand with gravel |              |            |
| Sample Comment:     | ---                                       |              |            |

## Particle Size Analysis - ASTM D422



| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|----------|----------|--------|--------------------|
| ---      | 30.8     | 35.9   | 33.3               |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|------------|----------------|---------------|---------------|----------|
| 1 in       | 25.00          | 100           |               |          |
| 0.75 in    | 19.00          | 92            |               |          |
| 0.5 in     | 12.50          | 83            |               |          |
| 0.375 in   | 9.50           | 80            |               |          |
| #4         | 4.75           | 69            |               |          |
| #10        | 2.00           | 62            |               |          |
| #20        | 0.85           | 57            |               |          |
| #40        | 0.42           | 54            |               |          |
| #60        | 0.25           | 50            |               |          |
| #100       | 0.15           | 45            |               |          |
| #200       | 0.075          | 33            |               |          |
|            |                |               |               |          |
|            |                |               |               |          |

### Coefficients

|                              |                       |
|------------------------------|-----------------------|
| D <sub>85</sub> = 13.9587 mm | D <sub>30</sub> = N/A |
| D <sub>60</sub> = 1.4758 mm  | D <sub>15</sub> = N/A |
| D <sub>50</sub> = 0.2409 mm  | D <sub>10</sub> = N/A |
| C <sub>u</sub> = N/A         | C <sub>c</sub> = N/A  |

### Classification

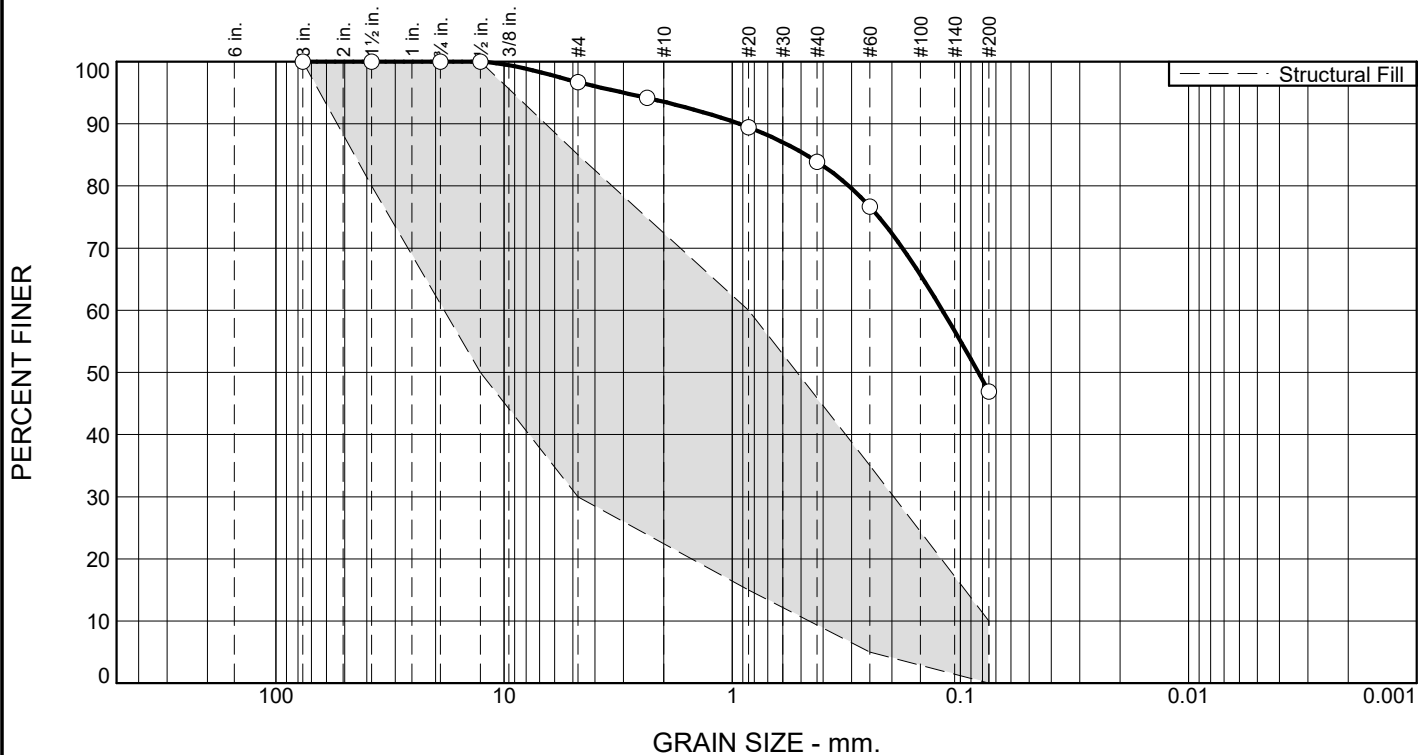
ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

### Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR  
Sand/Gravel Hardness : HARD

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |
|-------|----------|------|--------|--------|------|---------|
|       | Coarse   | Fine | Coarse | Medium | Fine |         |
| 0.0   | 0.0      | 3.3  | 3.2    | 9.6    | 37.0 | 46.9    |

| TEST RESULTS |               |                  |                |
|--------------|---------------|------------------|----------------|
| Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail) |
| 3            | 100.0         | 100.0            |                |
| 1.5          | 100.0         | 80.0 - 100.0     |                |
| 0.75         | 100.0         |                  |                |
| 0.5          | 100.0         | 50.0 - 100.0     |                |
| #4           | 96.7          | 30.0 - 85.0      | X              |
| #8           | 94.2          |                  |                |
| #20          | 89.4          | 15.0 - 60.0      | X              |
| #40          | 83.9          |                  |                |
| #60          | 76.7          | 5.0 - 35.0       | X              |
| #200         | 46.9          | 0.0 - 10.0       | X              |

\* Structural Fill

## Material Description

ASTM (D 2488) Classification: Silty SAND (SM), fine to medium, trace coarse, 45-50% fines, trace fine subangular gravel, brown, moist

## Atterberg Limits (ASTM D 4318)

PL= LL= PI=

## Classification

USCS (D 2487)= AASHTO (M 145)=

## Coefficients

D<sub>90</sub>= 0.9357 D<sub>85</sub>= 0.4753 D<sub>60</sub>= 0.1201  
D<sub>50</sub>= 0.0836 D<sub>30</sub>= D<sub>15</sub>=  
D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

## Remarks

Fill sample.

Date Received: 2/14/2018 Date Tested: 3/21/2018

Tested By: TS

Checked By: MC

Source of Sample: Boring B-105  
Sample Number: S3

Depth: 4' - 6'

Date Sampled: 2/14/2018



**LGCI**

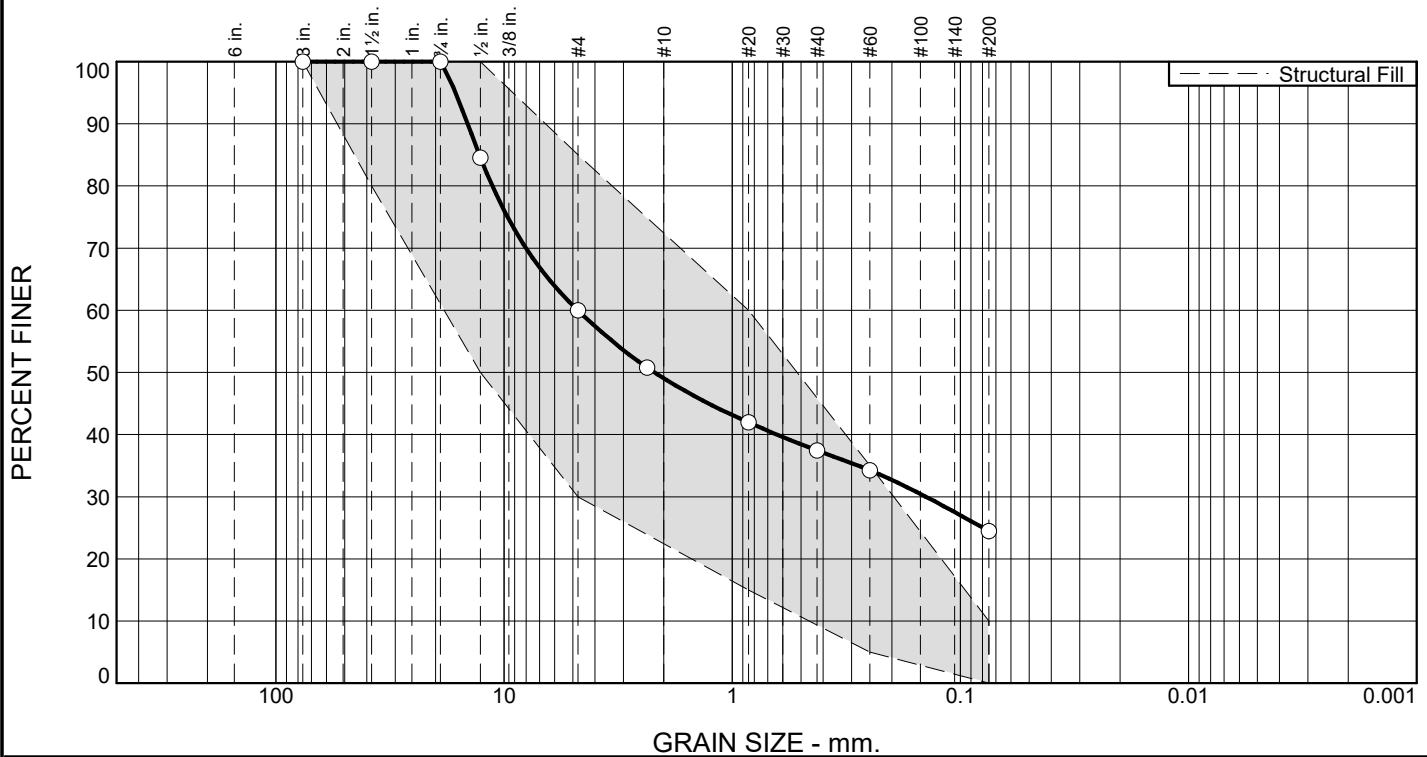
Lahlaf Geotechnical Consulting, Inc.

Client: Lamoureux Pagano & Associates, Inc.

Project: Proposed Worcester South High School, Worcester, Massachusetts

Project No: 1644

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |
|-------|----------|------|--------|--------|------|---------|
|       | Coarse   | Fine | Coarse | Medium | Fine |         |
| 0.0   | 0.0      | 40.0 | 10.9   | 11.7   | 13.0 | 24.4    |

| TEST RESULTS |               |                  |                |
|--------------|---------------|------------------|----------------|
| Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail) |
| 3            | 100.0         | 100.0            | X              |
| 1.5          | 100.0         | 80.0 - 100.0     |                |
| 0.75         | 100.0         |                  |                |
| 0.5          | 84.5          | 50.0 - 100.0     |                |
| #4           | 60.0          | 30.0 - 85.0      |                |
| #8           | 50.8          |                  |                |
| #20          | 42.0          | 15.0 - 60.0      |                |
| #40          | 37.4          |                  |                |
| #60          | 34.3          | 5.0 - 35.0       |                |
| #200         | 24.4          | 0.0 - 10.0       |                |

\* Structural Fill

## Material Description

ASTM (D 2488) Classification: Silty GRAVEL with Sand (GM), fine, angular, 20-25% fines, 35-40% fine to coarse sand, light brown, moist

## Atterberg Limits (ASTM D 4318)

PL=

LL=

PI=

## Classification

USCS (D 2487)=

AASHTO (M 145)=

## Coefficients

D<sub>90</sub>= 14.4567

D<sub>85</sub>= 12.8443

D<sub>60</sub>= 4.7532

D<sub>50</sub>= 2.1912

D<sub>30</sub>= 0.1418

D<sub>15</sub>=

D<sub>10</sub>=

C<sub>u</sub>=

C<sub>c</sub>=

## Remarks

Fill sample.

Date Received: 2/27/2018

Date Tested: 3/21/2018

Tested By: TS

Checked By: MC

Source of Sample: Boring B-110  
Sample Number: S2

Depth: 2' - 4'

Date Sampled: 2/26/2018



**LGCI**

Lahlaf Geotechnical Consulting, Inc.

Client: Lamoureux Pagano & Associates, Inc.

Project: Proposed Worcester South High School, Worcester, Massachusetts

Project No: 1644

**PERCENT FINER**



**% +3"**

|     | % Gravel      |
|-----|---------------|
| 1   | 0.075         |
| 2   | 0.075 - 0.075 |
| 3   | 0.075 - 0.075 |
| 4   | 0.075 - 0.075 |
| 5   | 0.075 - 0.075 |
| 6   | 0.075 - 0.075 |
| 7   | 0.075 - 0.075 |
| 8   | 0.075 - 0.075 |
| 9   | 0.075 - 0.075 |
| 10  | 0.075 - 0.075 |
| 11  | 0.075 - 0.075 |
| 12  | 0.075 - 0.075 |
| 13  | 0.075 - 0.075 |
| 14  | 0.075 - 0.075 |
| 15  | 0.075 - 0.075 |
| 16  | 0.075 - 0.075 |
| 17  | 0.075 - 0.075 |
| 18  | 0.075 - 0.075 |
| 19  | 0.075 - 0.075 |
| 20  | 0.075 - 0.075 |
| 21  | 0.075 - 0.075 |
| 22  | 0.075 - 0.075 |
| 23  | 0.075 - 0.075 |
| 24  | 0.075 - 0.075 |
| 25  | 0.075 - 0.075 |
| 26  | 0.075 - 0.075 |
| 27  | 0.075 - 0.075 |
| 28  | 0.075 - 0.075 |
| 29  | 0.075 - 0.075 |
| 30  | 0.075 - 0.075 |
| 31  | 0.075 - 0.075 |
| 32  | 0.075 - 0.075 |
| 33  | 0.075 - 0.075 |
| 34  | 0.075 - 0.075 |
| 35  | 0.075 - 0.075 |
| 36  | 0.075 - 0.075 |
| 37  | 0.075 - 0.075 |
| 38  | 0.075 - 0.075 |
| 39  | 0.075 - 0.075 |
| 40  | 0.075 - 0.075 |
| 41  | 0.075 - 0.075 |
| 42  | 0.075 - 0.075 |
| 43  | 0.075 - 0.075 |
| 44  | 0.075 - 0.075 |
| 45  | 0.075 - 0.075 |
| 46  | 0.075 - 0.075 |
| 47  | 0.075 - 0.075 |
| 48  | 0.075 - 0.075 |
| 49  | 0.075 - 0.075 |
| 50  | 0.075 - 0.075 |
| 51  | 0.075 - 0.075 |
| 52  | 0.075 - 0.075 |
| 53  | 0.075 - 0.075 |
| 54  | 0.075 - 0.075 |
| 55  | 0.075 - 0.075 |
| 56  | 0.075 - 0.075 |
| 57  | 0.075 - 0.075 |
| 58  | 0.075 - 0.075 |
| 59  | 0.075 - 0.075 |
| 60  | 0.075 - 0.075 |
| 61  | 0.075 - 0.075 |
| 62  | 0.075 - 0.075 |
| 63  | 0.075 - 0.075 |
| 64  | 0.075 - 0.075 |
| 65  | 0.075 - 0.075 |
| 66  | 0.075 - 0.075 |
| 67  | 0.075 - 0.075 |
| 68  | 0.075 - 0.075 |
| 69  | 0.075 - 0.075 |
| 70  | 0.075 - 0.075 |
| 71  | 0.075 - 0.075 |
| 72  | 0.075 - 0.075 |
| 73  | 0.075 - 0.075 |
| 74  | 0.075 - 0.075 |
| 75  | 0.075 - 0.075 |
| 76  | 0.075 - 0.075 |
| 77  | 0.075 - 0.075 |
| 78  | 0.075 - 0.075 |
| 79  | 0.075 - 0.075 |
| 80  | 0.075 - 0.075 |
| 81  | 0.075 - 0.075 |
| 82  | 0.075 - 0.075 |
| 83  | 0.075 - 0.075 |
| 84  | 0.075 - 0.075 |
| 85  | 0.075 - 0.075 |
| 86  | 0.075 - 0.075 |
| 87  | 0.075 - 0.075 |
| 88  | 0.075 - 0.075 |
| 89  | 0.075 - 0.075 |
| 90  | 0.075 - 0.075 |
| 91  | 0.075 - 0.075 |
| 92  | 0.075 - 0.075 |
| 93  | 0.075 - 0.075 |
| 94  | 0.075 - 0.075 |
| 95  | 0.075 - 0.075 |
| 96  | 0.075 - 0.075 |
| 97  | 0.075 - 0.075 |
| 98  | 0.075 - 0.075 |
| 99  | 0.075 - 0.075 |
| 100 | 0.075 - 0.075 |

|     | % Sand |
|-----|--------|
| 1   | 100    |
| 2   | 100    |
| 3   | 100    |
| 4   | 100    |
| 5   | 100    |
| 6   | 100    |
| 7   | 100    |
| 8   | 100    |
| 9   | 100    |
| 10  | 100    |
| 11  | 100    |
| 12  | 100    |
| 13  | 100    |
| 14  | 100    |
| 15  | 100    |
| 16  | 100    |
| 17  | 100    |
| 18  | 100    |
| 19  | 100    |
| 20  | 100    |
| 21  | 100    |
| 22  | 100    |
| 23  | 100    |
| 24  | 100    |
| 25  | 100    |
| 26  | 100    |
| 27  | 100    |
| 28  | 100    |
| 29  | 100    |
| 30  | 100    |
| 31  | 100    |
| 32  | 100    |
| 33  | 100    |
| 34  | 100    |
| 35  | 100    |
| 36  | 100    |
| 37  | 100    |
| 38  | 100    |
| 39  | 100    |
| 40  | 100    |
| 41  | 100    |
| 42  | 100    |
| 43  | 100    |
| 44  | 100    |
| 45  | 100    |
| 46  | 100    |
| 47  | 100    |
| 48  | 100    |
| 49  | 100    |
| 50  | 100    |
| 51  | 100    |
| 52  | 100    |
| 53  | 100    |
| 54  | 100    |
| 55  | 100    |
| 56  | 100    |
| 57  | 100    |
| 58  | 100    |
| 59  | 100    |
| 60  | 100    |
| 61  | 100    |
| 62  | 100    |
| 63  | 100    |
| 64  | 100    |
| 65  | 100    |
| 66  | 100    |
| 67  | 100    |
| 68  | 100    |
| 69  | 100    |
| 70  | 100    |
| 71  | 100    |
| 72  | 100    |
| 73  | 100    |
| 74  | 100    |
| 75  | 100    |
| 76  | 100    |
| 77  | 100    |
| 78  | 100    |
| 79  | 100    |
| 80  | 100    |
| 81  | 100    |
| 82  | 100    |
| 83  | 100    |
| 84  | 100    |
| 85  | 100    |
| 86  | 100    |
| 87  | 100    |
| 88  | 100    |
| 89  | 100    |
| 90  | 100    |
| 91  | 100    |
| 92  | 100    |
| 93  | 100    |
| 94  | 100    |
| 95  | 100    |
| 96  | 100    |
| 97  | 100    |
| 98  | 100    |
| 99  | 100    |
| 100 | 100    |

### % Fines

## TEST RESULTS

| Opening<br>Size | Percent<br>Finer | Spec.*<br>(Percent) | Pass?<br>(X=Fail) |
|-----------------|------------------|---------------------|-------------------|
| 3               | 100.0            | 100.0               |                   |
| 1.5             | 100.0            | 80.0 - 100.0        |                   |
| 0.75            | 100.0            |                     |                   |
| 0.5             | 86.3             | 50.0 - 100.0        |                   |
| #4              | 79.6             | 30.0 - 85.0         |                   |
| #8              | 74.6             |                     |                   |
| #20             | 68.4             | 15.0 - 60.0         | X                 |
| #40             | 61.4             |                     |                   |
| #60             | 54.6             | 5.0 - 35.0          | X                 |
| #200            | 27.9             | 0.0 - 10.0          | X                 |

ASTM (D 2488) Classification: Silty SAND with Gravel (SM), fine to coarse, 25-30% fines, 20-25% fine subrounded gravel, light brown, moist

PL= LL= PI=

**USCS (D 2487)=**

**AASHTO (M 145)=**

|      |         |      |         |      |        |
|------|---------|------|---------|------|--------|
| D90= | 14.1681 | D85= | 10.4931 | D60= | 0.3757 |
| D50= | 0.1928  | D30= | 0.0815  | D15= |        |
| D10= |         | Cu=  |         | Cc=  |        |

Natural sand sample.

**Tested By:** TS

**Checked By:** MC

**Source of Sample:** Boring B-110  
**Sample Number:** S4

**Date Sampled:** 2/26/2018



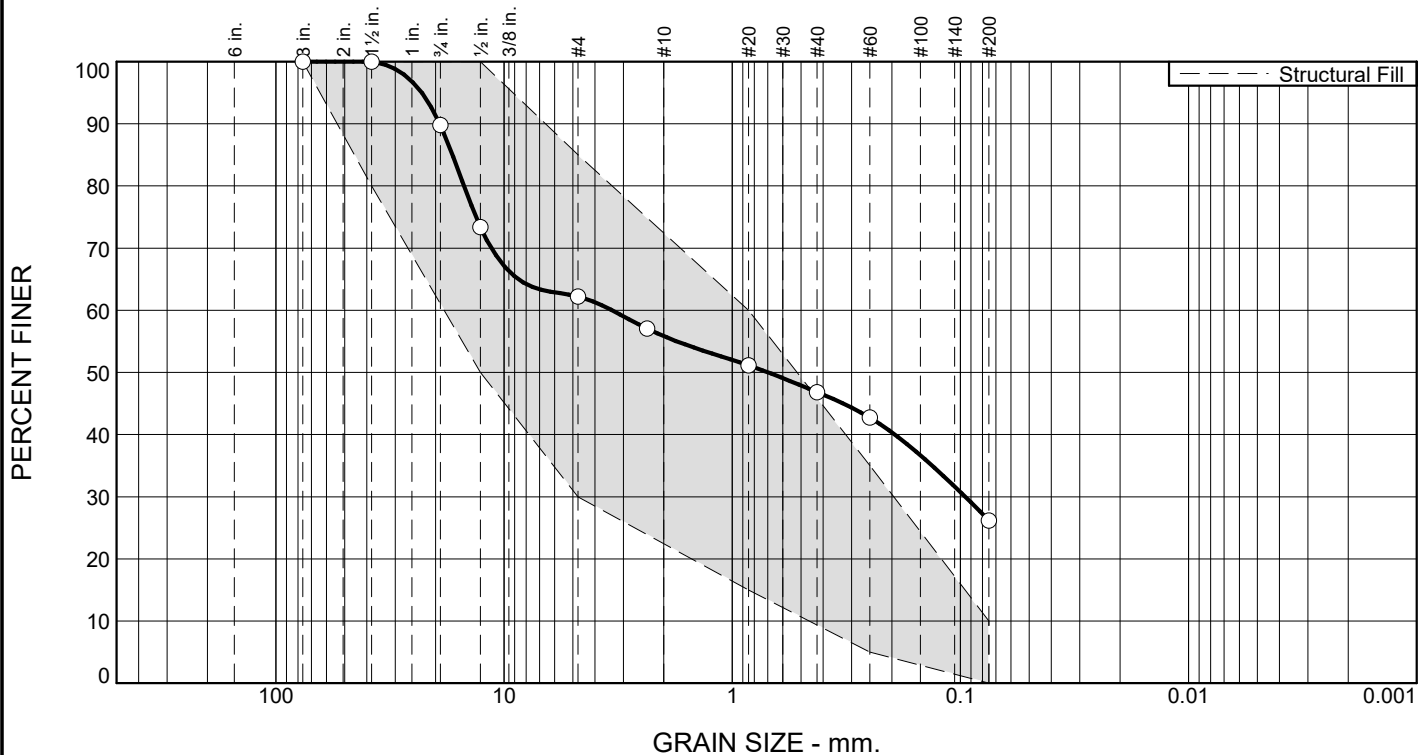
# LGCI

Lahlaf Geotechnical Consulting, Inc.

**Project:** Proposed Worcester South High School, Worcester, Massachusetts

**Project No:** 1644

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |
|-------|----------|------|--------|--------|------|---------|
|       | Coarse   | Fine | Coarse | Medium | Fine |         |
| 0.0   | 10.2     | 27.6 | 6.4    | 9.0    | 20.6 | 26.2    |

| TEST RESULTS |               |                  |                |
|--------------|---------------|------------------|----------------|
| Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail) |
| 3            | 100.0         | 100.0            |                |
| 1.5          | 100.0         | 80.0 - 100.0     |                |
| 0.75         | 89.8          |                  |                |
| 0.5          | 73.4          | 50.0 - 100.0     |                |
| #4           | 62.2          | 30.0 - 85.0      |                |
| #8           | 57.0          |                  |                |
| #20          | 51.1          | 15.0 - 60.0      |                |
| #40          | 46.8          |                  |                |
| #60          | 42.7          | 5.0 - 35.0       | X              |
| #200         | 26.2          | 0.0 - 10.0       | X              |

\* Structural Fill

## Material Description

ASTM (D 2488) Classification: Silty GRAVEL with Sand (GM), fine to coarse, subrounded, 25-30% fines, 35-40% fine to coarse sand, light brown, wet

## Atterberg Limits (ASTM D 4318)

PL= LL= PI=

## Classification

USCS (D 2487)= AASHTO (M 145)=

## Coefficients

D<sub>90</sub>= 19.1665 D<sub>85</sub>= 16.8457 D<sub>60</sub>= 3.3642  
D<sub>50</sub>= 0.6982 D<sub>30</sub>= 0.0956 D<sub>15</sub>=  
D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

## Remarks

Natural gravel sample.

Date Received: 2/27/2018 Date Tested: 3/21/2018

Tested By: TS

Checked By: MC

Source of Sample: Boring B-118B-OW  
Sample Number: S4

Depth: 6' - 8'

Date Sampled: 2/27/2018



**LGCI**

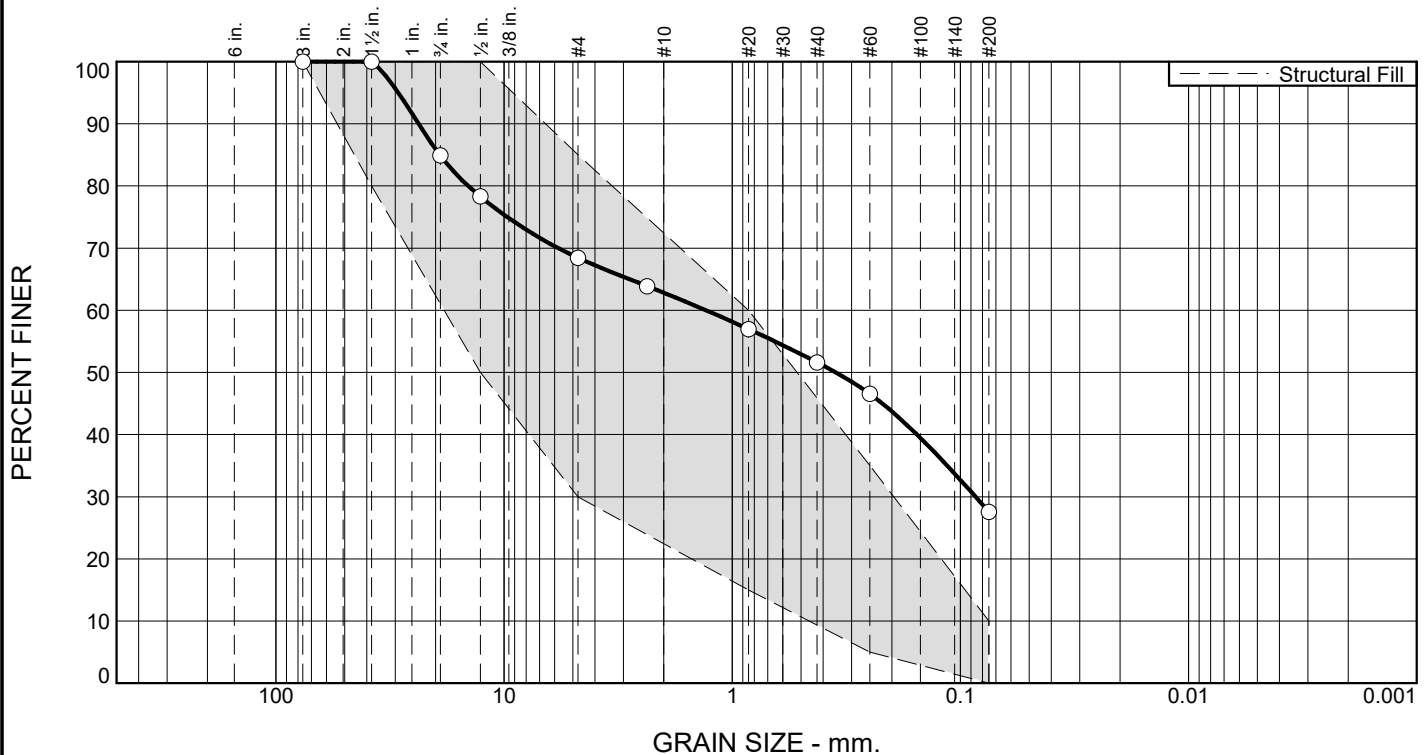
Lahlaf Geotechnical Consulting, Inc.

Client: Lamoureux Pagano & Associates, Inc.

Project: Proposed Worcester South High School, Worcester, Massachusetts

Project No: 1644

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |
|-------|----------|------|--------|--------|------|---------|
|       | Coarse   | Fine | Coarse | Medium | Fine |         |
| 0.0   | 15.1     | 16.5 | 5.6    | 11.2   | 24.0 | 27.6    |

| TEST RESULTS |               |                  |                |
|--------------|---------------|------------------|----------------|
| Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail) |
| 3            | 100.0         | 100.0            |                |
| 1.5          | 100.0         | 80.0 - 100.0     |                |
| 0.75         | 84.9          |                  |                |
| 0.5          | 78.3          | 50.0 - 100.0     |                |
| #4           | 68.4          | 30.0 - 85.0      |                |
| #8           | 63.9          |                  |                |
| #20          | 57.0          | 15.0 - 60.0      |                |
| #40          | 51.6          |                  |                |
| #60          | 46.5          | 5.0 - 35.0       | X              |
| #200         | 27.6          | 0.0 - 10.0       | X              |

\* Structural Fill

## Material Description

ASTM (D 2488) Classification: Silty SAND with Gravel (SM), fine to coarse, 25-30% fines, 30-35% fine to coarse angular gravel, trace organic fines, brown, wet

## Atterberg Limits (ASTM D 4318)

PL=

LL=

PI=

## Classification

USCS (D 2487)=

AASHTO (M 145)=

## Coefficients

D<sub>90</sub>= 23.7008

D<sub>85</sub>= 19.1451

D<sub>60</sub>= 1.3060

D<sub>50</sub>= 0.3523

D<sub>30</sub>= 0.0860

D<sub>15</sub>=

D<sub>10</sub>=

C<sub>u</sub>=

C<sub>c</sub>=

## Remarks

Fill sample.

Date Received: 3/1/2018

Date Tested: 3/22/2018

Tested By: TS

Checked By: MC

Source of Sample: Boring B-119A  
Sample Number: S4

Depth: 6' - 8'

Date Sampled: 2/28/2018



**LGCI**

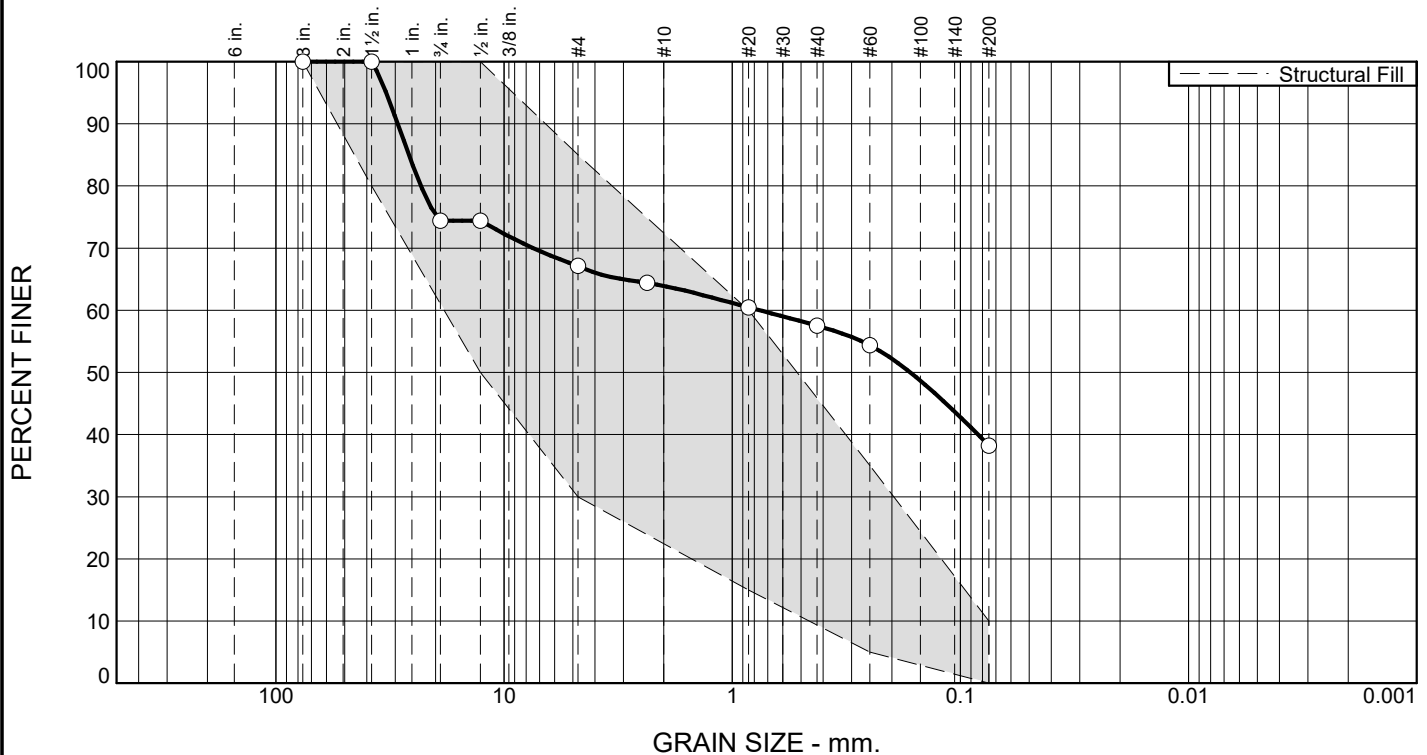
Lahlaf Geotechnical Consulting, Inc.

Client: Lamoureux Pagano & Associates, Inc.

Project: Proposed Worcester South High School, Worcester, Massachusetts

Project No: 1644

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |
|-------|----------|------|--------|--------|------|---------|
|       | Coarse   | Fine | Coarse | Medium | Fine |         |
| 0.0   | 25.6     | 7.3  | 3.2    | 6.4    | 19.3 | 38.2    |

| TEST RESULTS |               |                  |                |
|--------------|---------------|------------------|----------------|
| Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail) |
| 3            | 100.0         | 100.0            |                |
| 1.5          | 100.0         | 80.0 - 100.0     |                |
| 0.75         | 74.4          |                  |                |
| 0.5          | 74.4          | 50.0 - 100.0     |                |
| #4           | 67.1          | 30.0 - 85.0      |                |
| #8           | 64.4          |                  |                |
| #20          | 60.5          | 15.0 - 60.0      | X              |
| #40          | 57.5          |                  |                |
| #60          | 54.4          | 5.0 - 35.0       | X              |
| #200         | 38.2          | 0.0 - 10.0       | X              |

\* Structural Fill

## Material Description

ASTM (D 2488) Classification: Silty GRAVEL with Sand (GM), fine to coarse, angular, 35-40% fines, 25-30% fine to medium, trace coarse sand, light brown, wet

## Atterberg Limits (ASTM D 4318)

PL=

LL=

PI=

## Classification

USCS (D 2487)=

AASHTO (M 145)=

## Coefficients

D<sub>90</sub>= 29.2485

D<sub>85</sub>= 26.1409

D<sub>60</sub>= 0.7626

D<sub>50</sub>= 0.1658

D<sub>30</sub>=

D<sub>15</sub>=

D<sub>10</sub>=

C<sub>u</sub>=

C<sub>c</sub>=

## Remarks

Natural gravel sample.

Date Received: 3/1/2018

Date Tested: 3/22/2018

Tested By: TS

Checked By: MC

Source of Sample: Boring B-119A  
Sample Number: S7

Depth: 16' - 18'

Date Sampled: 2/28/2018



**LGCI**

Lahlaf Geotechnical Consulting, Inc.

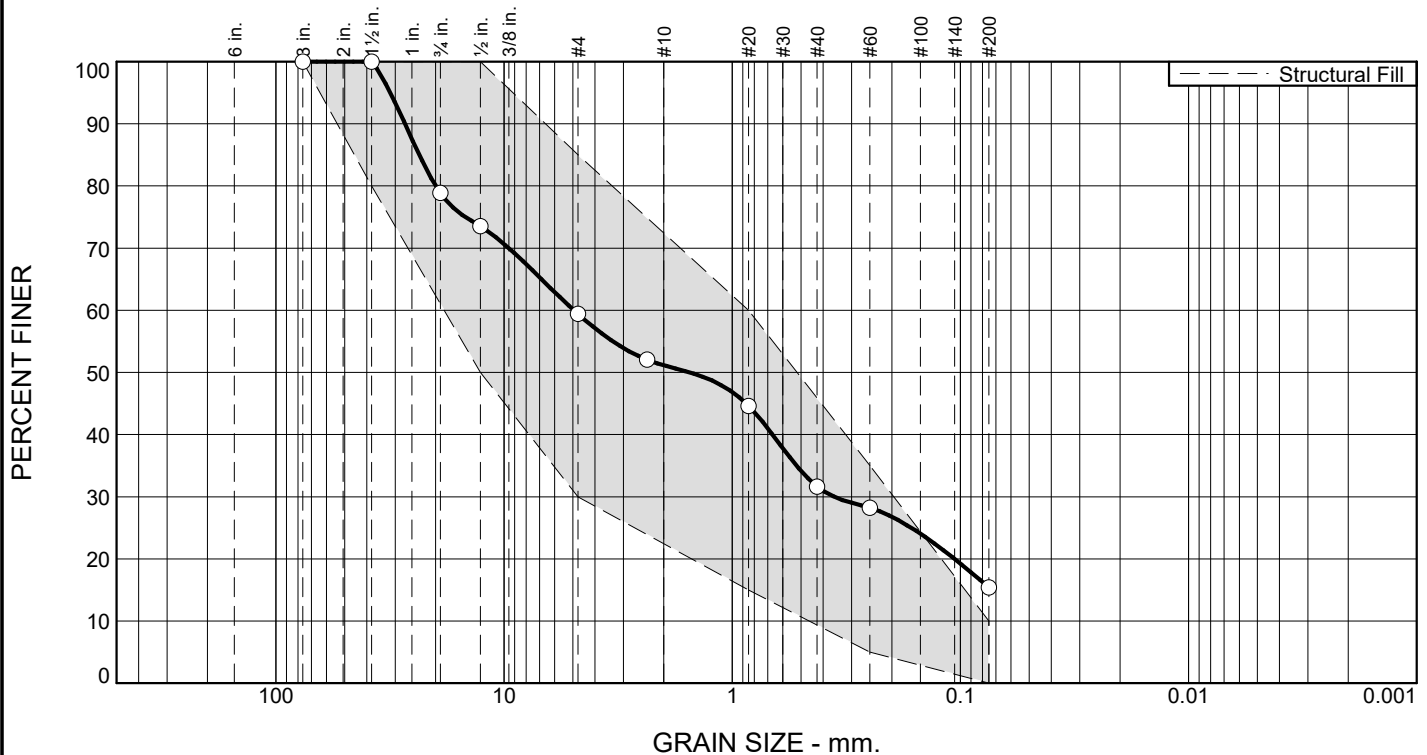
Client: Lamoureux Pagano & Associates, Inc.

Project: Proposed Worcester South High School, Worcester, Massachusetts

Project No: 1644



# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |
|-------|----------|------|--------|--------|------|---------|
|       | Coarse   | Fine | Coarse | Medium | Fine |         |
| 0.0   | 21.1     | 19.5 | 8.3    | 19.5   | 16.2 | 15.4    |

| TEST RESULTS |               |                  |                |
|--------------|---------------|------------------|----------------|
| Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail) |
| 3            | 100.0         | 100.0            | X              |
| 1.5          | 100.0         | 80.0 - 100.0     |                |
| 0.75         | 78.9          |                  |                |
| 0.5          | 73.5          | 50.0 - 100.0     |                |
| #4           | 59.4          | 30.0 - 85.0      |                |
| #8           | 52.0          |                  |                |
| #20          | 44.6          | 15.0 - 60.0      |                |
| #40          | 31.6          |                  |                |
| #60          | 28.2          | 5.0 - 35.0       |                |
| #200         | 15.4          | 0.0 - 10.0       |                |

\* Structural Fill

## Material Description

ASTM (D 2488) Classification: Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 40-45% fine to coarse angular gravel, brown, moist

## Atterberg Limits (ASTM D 4318)

PL=

LL=

PI=

## Classification

USCS (D 2487)=

AASHTO (M 145)=

## Coefficients

D<sub>90</sub>= 27.1926

D<sub>85</sub>= 23.5514

D<sub>60</sub>= 4.9533

D<sub>50</sub>= 1.5439

D<sub>30</sub>= 0.3583

D<sub>15</sub>=

D<sub>10</sub>=

C<sub>u</sub>=

C<sub>c</sub>=

## Remarks

Fill sample.

Date Received: 3/1/2018

Date Tested: 3/22/2018

Tested By: TS

Checked By: MC

Source of Sample: Boring B-124  
Sample Number: S3

Depth: 4' - 6'

Date Sampled: 3/1/2018



**LGCI**

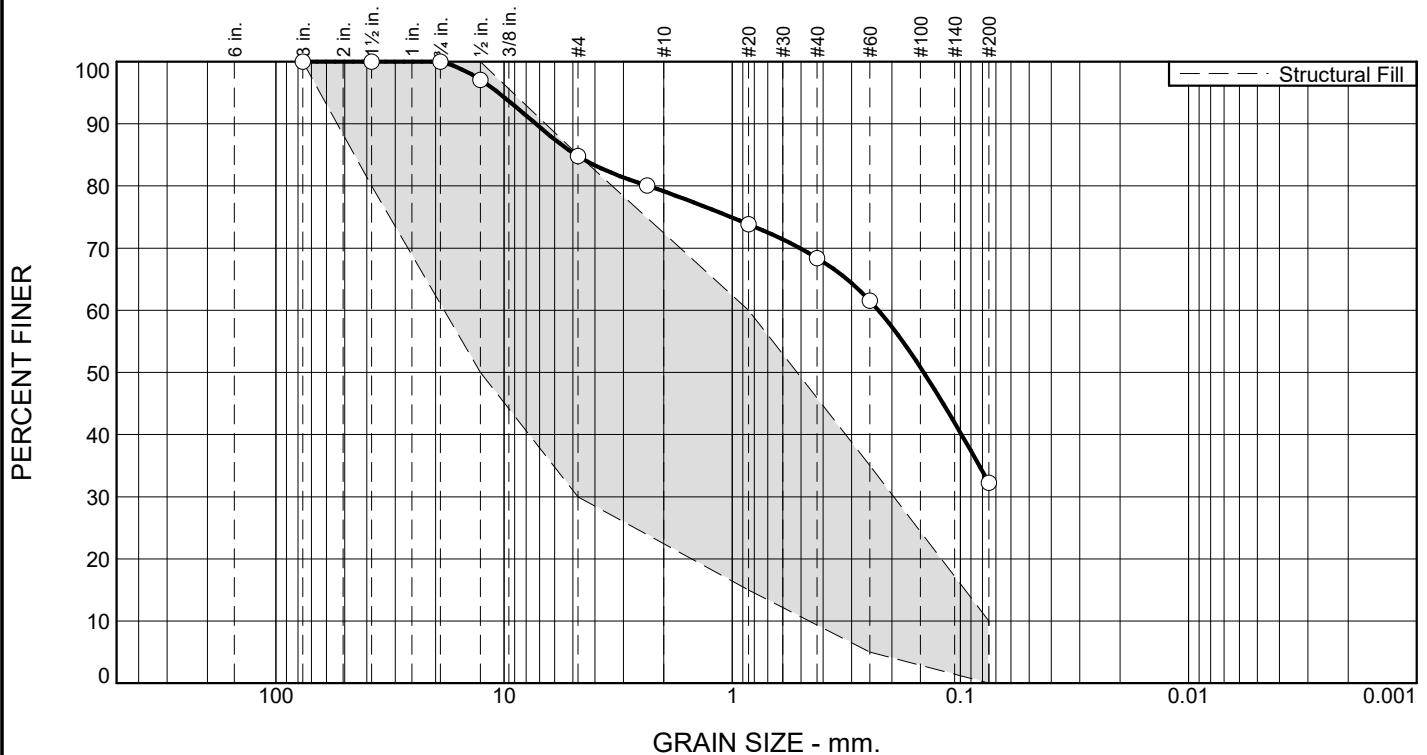
Lahlaf Geotechnical Consulting, Inc.

Client: Lamoureux Pagano & Associates, Inc.

Project: Proposed Worcester South High School, Worcester, Massachusetts

Project No: 1644

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |
|-------|----------|------|--------|--------|------|---------|
|       | Coarse   | Fine | Coarse | Medium | Fine |         |
| 0.0   | 0.0      | 15.2 | 5.7    | 10.7   | 36.1 | 32.3    |

| TEST RESULTS |               |                  |                |
|--------------|---------------|------------------|----------------|
| Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail) |
| 3            | 100.0         | 100.0            |                |
| 1.5          | 100.0         | 80.0 - 100.0     |                |
| 0.75         | 100.0         |                  |                |
| 0.5          | 97.1          | 50.0 - 100.0     |                |
| #4           | 84.8          | 30.0 - 85.0      |                |
| #8           | 80.1          |                  |                |
| #20          | 73.8          | 15.0 - 60.0      | X              |
| #40          | 68.4          |                  |                |
| #60          | 61.6          | 5.0 - 35.0       | X              |
| #200         | 32.3          | 0.0 - 10.0       | X              |

\* Structural Fill

## Material Description

ASTM (D 2488) Classification: Silty SAND with Gravel (SM), fine to coarse, 30-35% fines, 15-20% fine subangular gravel, light brown, moist

## Atterberg Limits (ASTM D 4318)

PL= LL= PI=

## Classification

USCS (D 2487)= AASHTO (M 145)=

## Coefficients

D<sub>90</sub>= 7.2696 D<sub>85</sub>= 4.8367 D<sub>60</sub>= 0.2290  
D<sub>50</sub>= 0.1449 D<sub>30</sub>= D<sub>15</sub>=  
D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

## Remarks

Fill sample.

Date Received: 2/14/2018 Date Tested: 3/20/2018

Tested By: TS

Checked By: MC

Source of Sample: Test Pit TP-101-IT  
Sample Number: S2

Depth: 1' - 7'

Date Sampled: 2/13/2018



**LGCI**

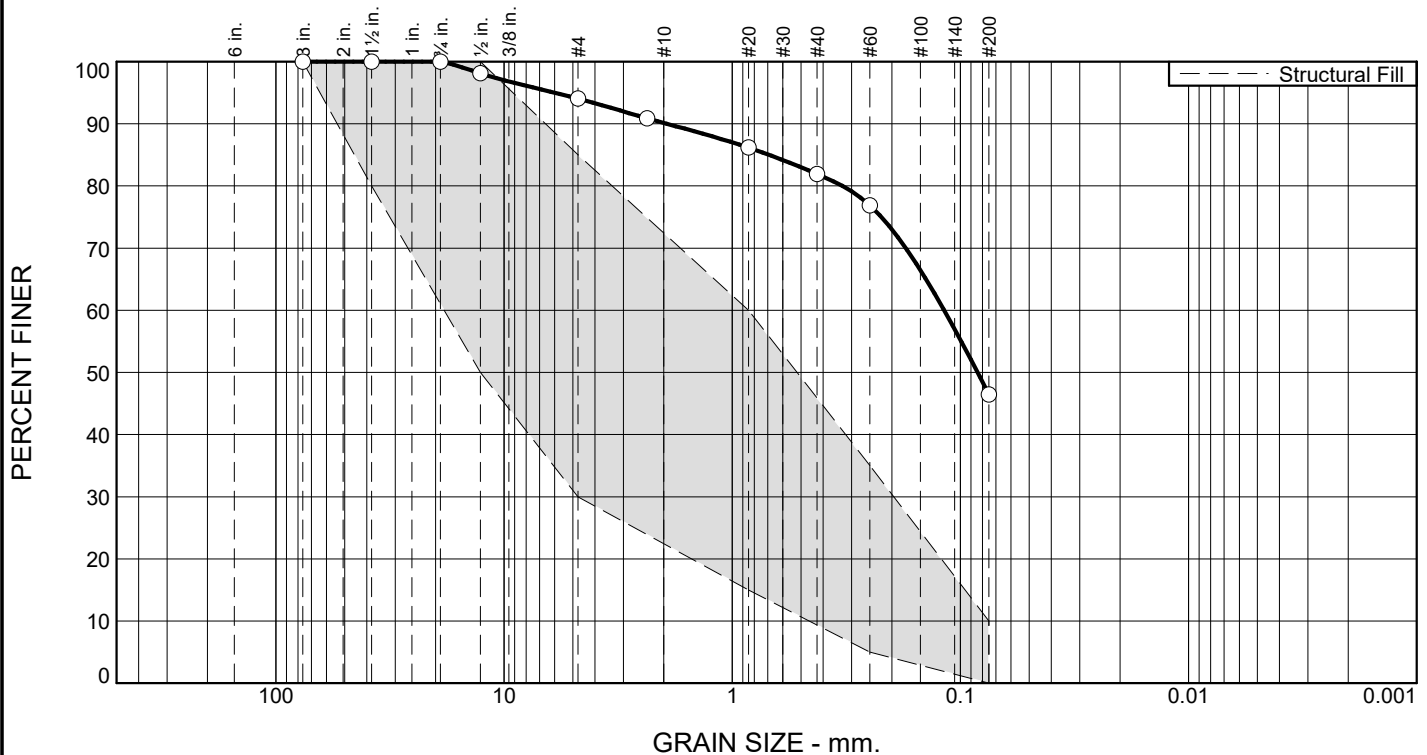
Lahlaf Geotechnical Consulting, Inc.

Client: Lamoureux Pagano & Associates, Inc.

Project: Proposed Worcester South High School, Worcester, Massachusetts

Project No: 1644

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |
|-------|----------|------|--------|--------|------|---------|
|       | Coarse   | Fine | Coarse | Medium | Fine |         |
| 0.0   | 0.0      | 6.0  | 3.9    | 8.2    | 35.5 | 46.4    |

| TEST RESULTS |               |                  |                |
|--------------|---------------|------------------|----------------|
| Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail) |
| 3            | 100.0         | 100.0            |                |
| 1.5          | 100.0         | 80.0 - 100.0     |                |
| 0.75         | 100.0         |                  |                |
| 0.5          | 98.1          | 50.0 - 100.0     |                |
| #4           | 94.0          | 30.0 - 85.0      | X              |
| #8           | 90.9          |                  |                |
| #20          | 86.2          | 15.0 - 60.0      | X              |
| #40          | 81.9          |                  |                |
| #60          | 76.9          | 5.0 - 35.0       | X              |
| #200         | 46.4          | 0.0 - 10.0       | X              |

\* Structural Fill

## Material Description

ASTM (D 2488) Classification: Silty SAND (SM), fine to medium, trace coarse, 45-50% fines, 5-10% fine subangular gravel, trace roots, trace organic fines, brown, moist

## Atterberg Limits (ASTM D 4318)

PL= LL= PI=

## Classification

USCS (D 2487)= AASHTO (M 145)=

## Coefficients

D<sub>90</sub>= 1.9390 D<sub>85</sub>= 0.6889 D<sub>60</sub>= 0.1180  
D<sub>50</sub>= 0.0842 D<sub>30</sub>= D<sub>15</sub>=  
D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

## Remarks

Fill sample.

Date Received: 2/16/2018 Date Tested: 3/20/2018

Tested By: TS

Checked By: MC

Source of Sample: Test Pit TP-102  
Sample Number: S2

Depth: 2' - 6'

Date Sampled: 2/12/2018



**LGCI**

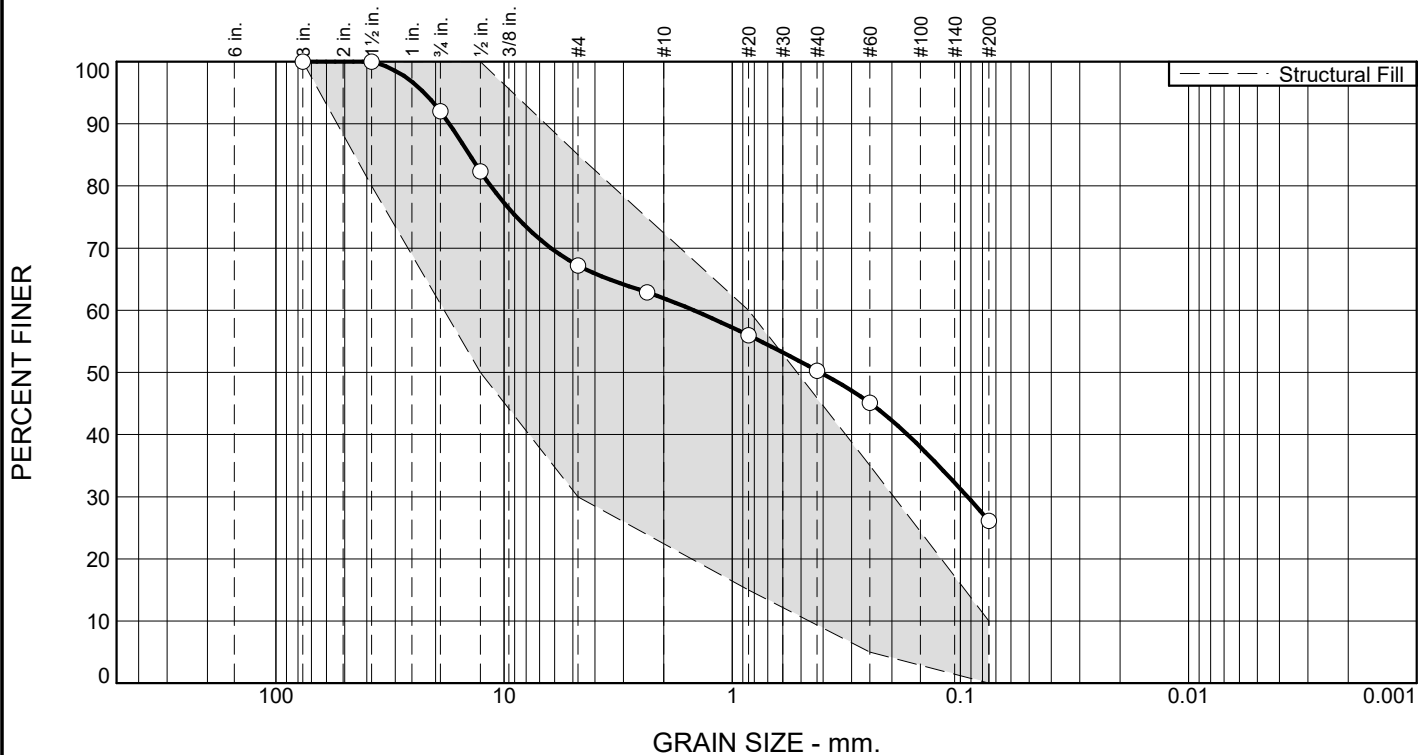
Lahlaf Geotechnical Consulting, Inc.

Client: Lamoureux Pagano & Associates, Inc.

Project: Proposed Worcester South High School, Worcester, Massachusetts

Project No: 1644

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |
|-------|----------|------|--------|--------|------|---------|
|       | Coarse   | Fine | Coarse | Medium | Fine |         |
| 0.0   | 8.0      | 24.8 | 5.3    | 11.6   | 24.2 | 26.1    |

| TEST RESULTS |               |                  |                |
|--------------|---------------|------------------|----------------|
| Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail) |
| 3            | 100.0         | 100.0            |                |
| 1.5          | 100.0         | 80.0 - 100.0     |                |
| 0.75         | 92.0          |                  |                |
| 0.5          | 82.3          | 50.0 - 100.0     |                |
| #4           | 67.2          | 30.0 - 85.0      |                |
| #8           | 62.9          |                  |                |
| #20          | 56.0          | 15.0 - 60.0      |                |
| #40          | 50.3          |                  |                |
| #60          | 45.1          | 5.0 - 35.0       | X              |
| #200         | 26.1          | 0.0 - 10.0       | X              |

\* Structural Fill

## Material Description

ASTM (D 2488) Classification: Silty SAND with Gravel (SM), fine to coarse, 25-30% fines, 30-35% fine to coarse subangular gravel, trace organic fines, brown, moist

## Atterberg Limits (ASTM D 4318)

PL=

LL=

PI=

## Classification

USCS (D 2487)=

AASHTO (M 145)=

## Coefficients

D<sub>90</sub>= 17.3907

D<sub>85</sub>= 14.1714

D<sub>60</sub>= 1.4775

D<sub>50</sub>= 0.4115

D<sub>30</sub>= 0.0933

D<sub>15</sub>=

D<sub>10</sub>=

C<sub>u</sub>=

C<sub>c</sub>=

## Remarks

Fill sample.

Date Received: 2/16/2018

Date Tested: 3/21/2018

Tested By: TS

Checked By: MC

Source of Sample: Test Pit TP-111  
Sample Number: S2

Depth: 0.8' - 5'

Date Sampled: 2/12/2018



**LGCi**

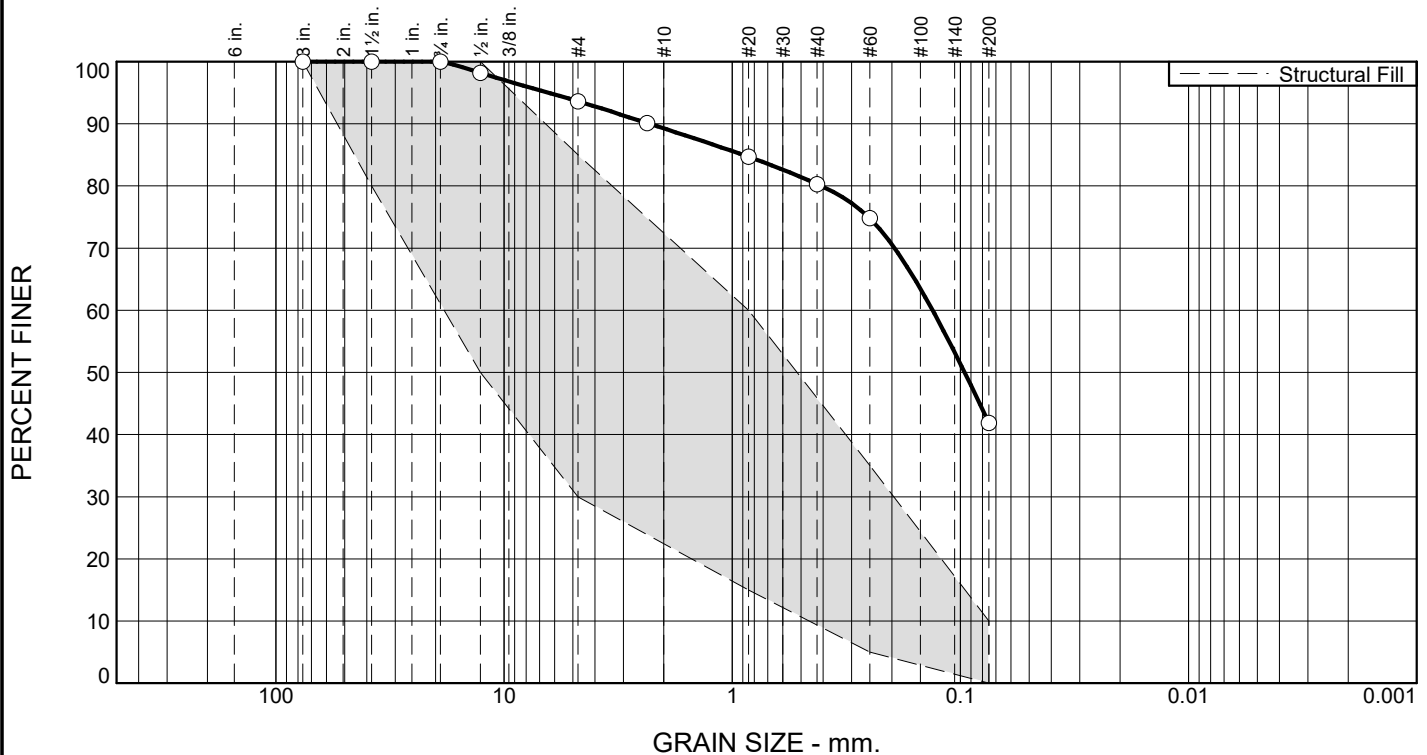
Lahlaf Geotechnical Consulting, Inc.

Client: Lamoureux Pagano & Associates, Inc.

Project: Proposed Worcester South High School, Worcester, Massachusetts

Project No: 1644

# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |
|-------|----------|------|--------|--------|------|---------|
|       | Coarse   | Fine | Coarse | Medium | Fine |         |
| 0.0   | 0.0      | 6.4  | 4.3    | 9.0    | 38.4 | 41.9    |

| TEST RESULTS |               |                  |                |
|--------------|---------------|------------------|----------------|
| Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail) |
| 3            | 100.0         | 100.0            |                |
| 1.5          | 100.0         | 80.0 - 100.0     |                |
| 0.75         | 100.0         |                  |                |
| 0.5          | 98.2          | 50.0 - 100.0     |                |
| #4           | 93.6          | 30.0 - 85.0      | X              |
| #8           | 90.1          |                  |                |
| #20          | 84.7          | 15.0 - 60.0      | X              |
| #40          | 80.3          |                  |                |
| #60          | 74.8          | 5.0 - 35.0       | X              |
| #200         | 41.9          | 0.0 - 10.0       | X              |

\* Structural Fill

## Material Description

ASTM (D 2488) Classification: Silty SAND (SM), fine to medium, trace coarse, 40-45% fines, 5-10% fine angular gravel, trace roots, light brown, moist

## Atterberg Limits (ASTM D 4318)

PL= LL= PI=

## Classification

USCS (D 2487)= AASHTO (M 145)=

## Coefficients

D<sub>90</sub>= 2.3140 D<sub>85</sub>= 0.8979 D<sub>60</sub>= 0.1325  
D<sub>50</sub>= 0.0960 D<sub>30</sub>= D<sub>15</sub>=  
D<sub>10</sub>= C<sub>u</sub>= C<sub>c</sub>=

## Remarks

Fill sample.

Date Received: 2/23/2018 Date Tested: 3/21/2018

Tested By: TS

Checked By: MC

Source of Sample: Test Pit TP-120  
Sample Number: S2

Depth: 2.5' - 5'

Date Sampled: 2/23/2018



**LGCI**

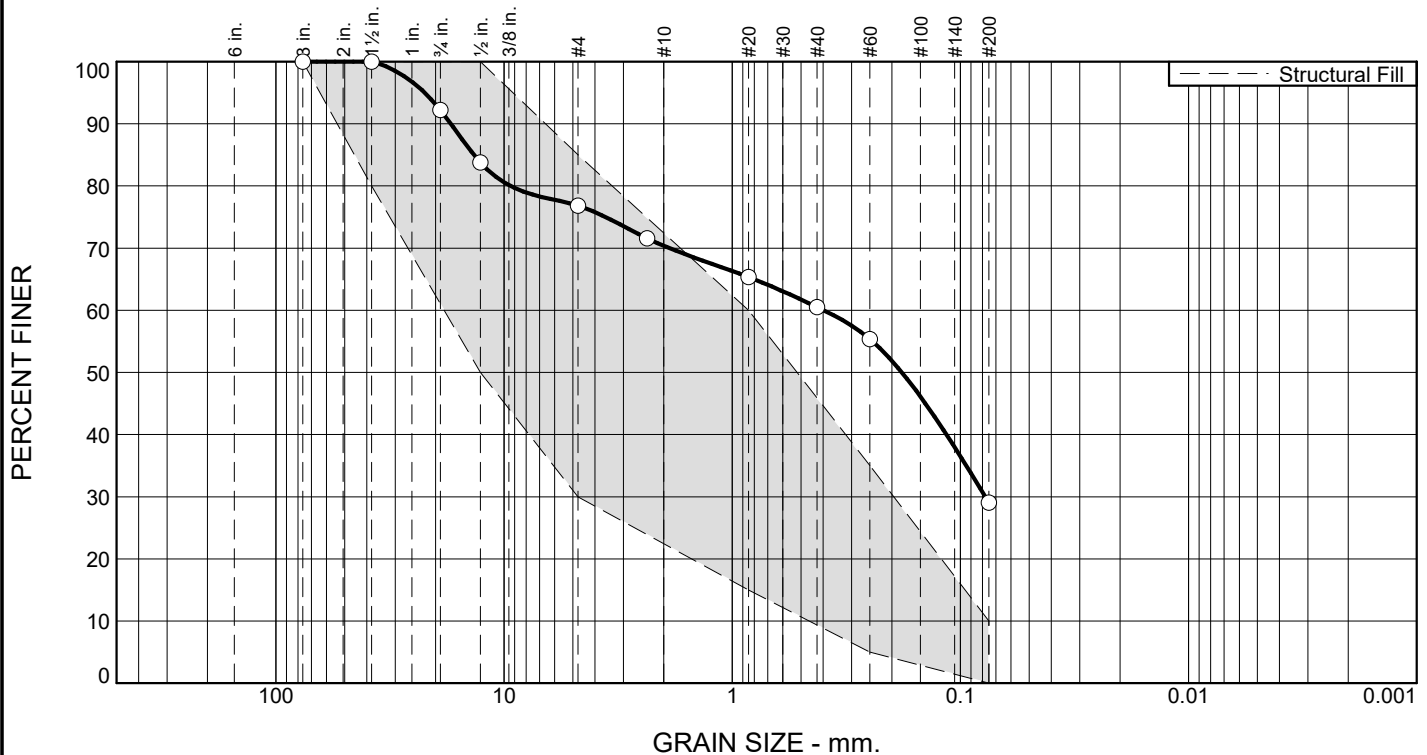
Lahlaf Geotechnical Consulting, Inc.

Client: Lamoureux Pagano & Associates, Inc.

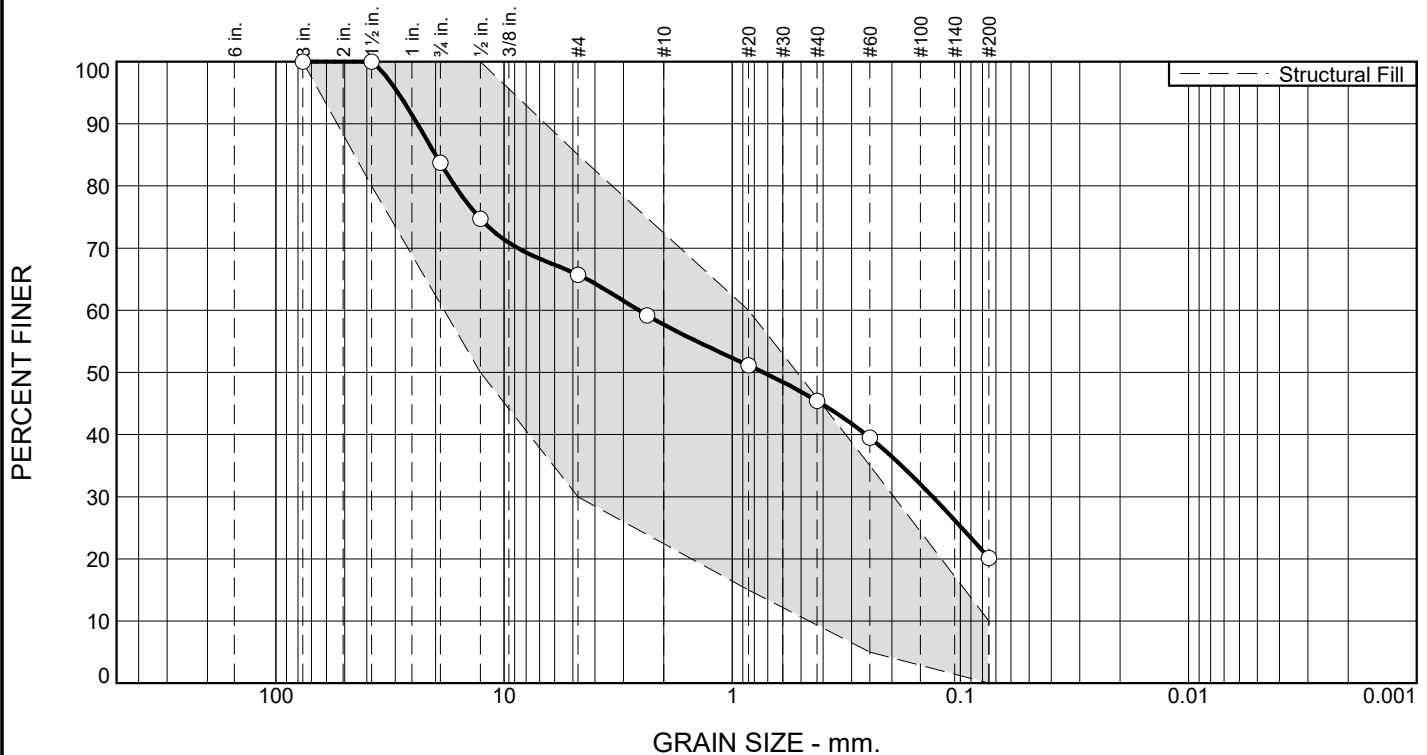
Project: Proposed Worcester South High School, Worcester, Massachusetts

Project No: 1644

# Particle Size Distribution Report



# Particle Size Distribution Report



| % +3" | % Gravel |      | % Sand |        |      | % Fines |
|-------|----------|------|--------|--------|------|---------|
|       | Coarse   | Fine | Coarse | Medium | Fine |         |
| 0.0   | 16.3     | 18.0 | 8.0    | 12.3   | 25.2 | 20.2    |

| TEST RESULTS |               |                  |                |
|--------------|---------------|------------------|----------------|
| Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail) |
| 3            | 100.0         | 100.0            |                |
| 1.5          | 100.0         | 80.0 - 100.0     |                |
| 0.75         | 83.7          |                  |                |
| 0.5          | 74.7          | 50.0 - 100.0     |                |
| #4           | 65.7          | 30.0 - 85.0      |                |
| #8           | 59.2          |                  |                |
| #20          | 51.1          | 15.0 - 60.0      |                |
| #40          | 45.4          |                  |                |
| #60          | 39.5          | 5.0 - 35.0       | X              |
| #200         | 20.2          | 0.0 - 10.0       | X              |

\* Structural Fill

## Material Description

ASTM (D 2488) Classification: Silty SAND with Gravel (SM), fine to coarse, 20-25% fines, 30-35% fine to coarse subrounded gravel, trace organic fines, trace roots, wood, light brown, moist

## Atterberg Limits (ASTM D 4318)

PL=

LL=

PI=

## Classification

USCS (D 2487)=

AASHTO (M 145)=

## Coefficients

D<sub>90</sub>= 24.0100

D<sub>85</sub>= 19.9882

D<sub>60</sub>= 2.5694

D<sub>50</sub>= 0.7310

D<sub>30</sub>= 0.1325

D<sub>15</sub>=

D<sub>10</sub>=

C<sub>u</sub>=

C<sub>c</sub>=

## Remarks

Fill sample.

Date Received: 2/22/2018

Date Tested: 3/21/2018

Tested By: TS

Checked By: MC

Source of Sample: Test Pit TP-124  
Sample Number: S2

Depth: 1' - 7'

Date Sampled: 2/22/2018



**LGCI**

Lahlaf Geotechnical Consulting, Inc.

Client: Lamoureux Pagano & Associates, Inc.

Project: Proposed Worcester South High School, Worcester, Massachusetts

Project No: 1644

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# **APPENDIX D**

## **SOILS MANAGEMENT LETTER**

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# Lord Associates, Inc.

*Environmental Consulting & Licensed Site Professional Services*

1506 Providence Highway - Suite 30  
Norwood, MA 02062-4647

Voice: 781.255.5554  
Fax: 781.255.5535  
www.lordenv.com

February 12, 2018

Mr. Eric Moore  
Lamoureux Pagano Associates, Inc.  
108 Grove Street, Suite 300  
Worcester, Massachusetts 01605

RE: Arsenic in Soil Sample Results  
Worcester South High School  
Worcester, MA.

Dear Eric,

Pursuant to your request, Lord Associates, Inc. (LAI) has prepared the following summary of soil sampling results from the Worcester South High School project in Worcester, Massachusetts. The purpose of this soil sampling was to pre-characterize the arsenic content in soil that may be excavated during development of the property for a new school. Recommendations are offered for the on-site management of these soils.

## ***Method***

The locations of the samples were selected based on geotechnical considerations determined by Lahlaf Geotechnical Consulting, Inc. (LGCI). A series of exploratory test pits and test borings were completed by LGCI in August of 2017. The excavating and drilling services were provided by Northern Drill Services. Boring logs and geotechnical evaluation were provided to the client under separate cover.

LAI selected representative sub-samples from the geotechnical soil samples for total arsenic analyses by a state-certified laboratory (Alpha Analytical, Inc.). Initially samples were selected from the shallow soil horizon (generally 1-3' bsg). Based on these results, Additional samples were submitted for analyses from the maximum depth sampled (generally 3-12' bsg in test pits and 14-21' bsg in test borings). Soil types were generally observed to be a brown silty sand with gravel. Sub-samples were removed from the drillers jars or plastic bags and placed in laboratory prepared glass jars for transport to the analytical laboratory. The samples were analyzed for total solids and arsenic via EPA Methods 3050B and 6010C.

## ***Results***

The results of the testing for arsenic were compared to Massachusetts residential cleanup standards ("S-1/GW-2") as wells as the Comm -97-001 landfill parameter to allow for a wider range of disposal option selection. As shown on **Table 1**, arsenic was detected at concentrations ranging from 9 to 53 mg/kg. Twenty-six of the 31 samples had concentrations greater than the applicable standard of 20 mg/kg. The data collected from the shallow samples was comparable to that from the deeper samples collected (within one standard deviation). The average shallow concentration was 35 mg/kg, and the deeper concentration was 29 mg/kg. Six of the samples exceeded the 40 mg/kg Massachusetts landfill limit.

## ***Opinion***

Based on concentration ranges, site location and history, we are of the opinion that the source of the elevated arsenic is natural rock formations. The lack of a discernable vertical or horizontal distribution corroborates this opinion. As such, these concentrations are exempt from MADEP notification pursuant to the Massachusetts Contingency Plan (MCP) regulations (310 CMR 40.0317(22)). Nevertheless, MADEP guidance and policy (WSC#-13-500) dictates that the soil be managed appropriately to limit exposure potential. Therefore, the following soil management recommendations are offered.

## ***Recommendations***

---

To limit exposure potential in proposed development areas where human activity is likely to be greater than other areas of the property such as playgrounds, athletic fields, and gardens, it is recommended that this naturally-occurring soil be either:

- buried at a depth at least three feet below surface grade with "clean" fill less than 20 mg/kg;
- located under permanent structures or pavement; or
- covered with filter fabric or other effective membrane under a minimum of 12 inches of "clean" topsoil (i.e., <20 mg/kg), mulch, or subgrade material for athletic field turf.

At other areas of the proposed development less accessible such as roadways or narrow strips between walkways, it will be acceptable to use these excavated soils as sub-grade fill under the design's landscaping, assuming appropriate measures are taken to mitigate erosion.

Off-site disposal options are restricted to "like" sites (as defined by MADEP WSC#13-500) or landfills that are permitted to accept soils as characterized. MADEP notification is not required to transport the soil for disposal. A standard Material Shipping Record may be used to document the material transport. We recommend you provide the prospective disposal facility with a copy of these results for their approval. We also recommend the use of Best Management Practices to control excess dust during excavation activities.

We would be pleased to assist you with the dust monitoring or in the selection of a disposal facility and/or to assist in the application process if needed. To do this we would require an estimate of the total cubic yardage and schedule for disposal.

Please contact me if you have any questions.

Sincerely,  
**LORD ASSOCIATES, INC.**



Ralph J. Tella, LSP, CHMM  
President and Senior Project Manager

Attached: Site Plans  
Table 1 Soil Results Summary  
Copy of Laboratory Results

# **APPENDIX E**

## **ARSENIC ANALYTICAL REPORT**

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## ANALYTICAL REPORT

|                 |  |
|-----------------|--|
| Lab Number:     | L1739826   |
| Client:         | Lord Associates, Inc.<br>1506 Providence Highway - Suite 30<br>Norwood, MA 02062 |
| ATTN:           | Jon Puliafico  |
| Phone:          | (781) 255-5554   |
| Project Name:   | VEC-WORCESTER SOUTH  |
| Project Number: | 2604   |
| Report Date:    | 11/10/17   |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), NJ NELAP (MA935), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-14-00197).

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Eight Walkup Drive, Westborough, MA 01581-1019  
508-898-9220 (Fax) 508-898-9193 800-624-9220 - [www.alphalab.com](http://www.alphalab.com)



**Project Name:** VEC-WORCESTER SOUTH  
**Project Number:** 2604

**Lab Number:** L1739826  
**Report Date:** 11/10/17

| <b>Alpha<br/>Sample ID</b> | <b>Client ID</b> | <b>Matrix</b> | <b>Sample<br/>Location</b> | <b>Collection<br/>Date/Time</b> | <b>Receive Date</b> |
|----------------------------|------------------|---------------|----------------------------|---------------------------------|---------------------|
| L1739826-01                | B-1 0'-2'        | SOIL          | Not Specified              | 08/11/17 00:00                  | 11/01/17            |
| L1739826-02                | B-2 0'-2'        | SOIL          | Not Specified              | 08/10/17 00:00                  | 11/01/17            |
| L1739826-03                | B-3 0'-2'        | SOIL          | Not Specified              | 08/11/17 00:00                  | 11/01/17            |
| L1739826-04                | B-4 0'-2'        | SOIL          | Not Specified              | 08/10/17 00:00                  | 11/01/17            |
| L1739826-05                | B-5 0'-2'        | SOIL          | Not Specified              | 08/10/17 00:00                  | 11/01/17            |
| L1739826-06                | B-6 0'-2'        | SOIL          | Not Specified              | 08/10/17 00:00                  | 11/01/17            |
| L1739826-07                | B-7 0'-2'        | SOIL          | Not Specified              | 08/11/17 00:00                  | 11/01/17            |
| L1739826-08                | B-8 0.5'-2'      | SOIL          | Not Specified              | 08/11/17 00:00                  | 11/01/17            |
| L1739826-09                | TP-3 10"-3'2"    | SOIL          | Not Specified              | 08/15/17 00:00                  | 11/01/17            |
| L1739826-10                | TP-4 1'4"-2'6"   | SOIL          | Not Specified              | 08/15/17 00:00                  | 11/01/17            |
| L1739826-11                | TP-5 11"-2'      | SOIL          | Not Specified              | 08/14/17 00:00                  | 11/01/17            |
| L1739826-12                | TP-6 0"-10"      | SOIL          | Not Specified              | 08/14/17 00:00                  | 11/01/17            |
| L1739826-13                | TP-7 7"-18"      | SOIL          | Not Specified              | 08/14/17 00:00                  | 11/01/17            |
| L1739826-14                | TP-8 8"-2'2"     | SOIL          | Not Specified              | 08/14/17 00:00                  | 11/01/17            |
| L1739826-15                | TP-10 7"-2'      | SOIL          | Not Specified              | 08/14/17 00:00                  | 11/01/17            |



Project Name: VEC-WORCESTER SOUTH

Lab Number: L1739826

Project Number: 2604

Report Date: 11/10/17

**MADEP MCP Response Action Analytical Report Certification**

**This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.**

|  |   |     |
|--|---|-----|
| <b>An affirmative response to questions A through F is required for "Presumptive Certainty" status</b>       |   |     |
| A  | Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times? | YES |
| B  | Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?  | YES |
| C  | Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?  | YES |
| D  | Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"                      | YES |
| E a.   | VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).   | N/A |
| E b.   | APH and TO-15 Methods only: Was the complete analyte list reported for each method?   | N/A |
| F  | Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?                                   | YES |
| <b>A response to questions G, H and I is required for "Presumptive Certainty" status</b>                     |   |     |
| G  | Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?   | YES |
| H  | Were all QC performance standards specified in the CAM protocol(s) achieved?  | NO  |
| I  | Were results reported for the complete analyte list specified in the selected CAM protocol(s)?  | NO  |
| <b>For any questions answered "No", please refer to the case narrative section on the following page(s).</b> |   |     |

**Please note that sample matrix information is located in the Sample Results section of this report.**



**Project Name:** VEC-WORCESTER SOUTH  
**Project Number:** 2604

**Lab Number:** L1739826  
**Report Date:** 11/10/17

### Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

#### HOLD POLICY

For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

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**Project Name:** VEC-WORCESTER SOUTH  
**Project Number:** 2604

**Lab Number:** L1739826  
**Report Date:** 11/10/17

**Case Narrative (continued)**

MCP Related Narratives

Sample Receipt

In reference to question H:

A Matrix Spike was not submitted for the analysis of Total Metals.

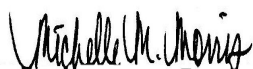
Total Metals

In reference to question I:

All samples were analyzed for a subset of MCP analytes per the Chain of Custody.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:



Michelle M. Morris

Title: Technical Director/Representative

Date: 11/10/17

## METALS

**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-01

Date Collected: 08/11/17 00:00

Client ID: B-1 0'-2'

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 85%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 43.3 |  | mg/kg | 0.464 | -- | 1 | 11/02/17 22:55 | 11/09/17 18:33 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|



**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-02

Date Collected: 08/10/17 00:00

Client ID: B-2 0'-2'

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 80%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 36.8 |  | mg/kg | 0.486 | -- | 1 | 11/02/17 22:55 | 11/09/17 18:38 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|



**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-03

Date Collected: 08/11/17 00:00

Client ID: B-3 0'-2'

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 86%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 34.6 |  | mg/kg | 0.439 | -- | 1 | 11/02/17 22:55 | 11/09/17 18:42 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|



**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-04

Date Collected: 08/10/17 00:00

Client ID: B-4 0'-2'

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 87%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Prep<br>Method | Analytical<br>Method | Analyst |
|-----------|--------|-----------|-------|----|-----|--------------------|------------------|------------------|----------------|----------------------|---------|
|-----------|--------|-----------|-------|----|-----|--------------------|------------------|------------------|----------------|----------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 32.4 |  | mg/kg | 0.441 | -- | 1 | 11/02/17 22:55 | 11/09/17 18:47 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|





**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-05

Date Collected: 08/10/17 00:00

Client ID: B-5 0'-2'

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 87%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Prep<br>Method | Analytical<br>Method | Analyst |
|-----------|--------|-----------|-------|----|-----|--------------------|------------------|------------------|----------------|----------------------|---------|
|-----------|--------|-----------|-------|----|-----|--------------------|------------------|------------------|----------------|----------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 26.2 |  | mg/kg | 0.453 | -- | 1 | 11/02/17 22:55 | 11/09/17 18:52 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|



**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-06

Date Collected: 08/10/17 00:00

Client ID: B-6 0'-2'

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 86%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 42.0 |  | mg/kg | 0.460 | -- | 1 | 11/02/17 22:55 | 11/09/17 18:57 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|



**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-07

Date Collected: 08/11/17 00:00

Client ID: B-7 0'-2'

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 85%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 33.9 |  | mg/kg | 0.458 | -- | 1 | 11/02/17 22:55 | 11/09/17 19:01 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|



**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-08

Date Collected: 08/11/17 00:00

Client ID: B-8 0.5'-2'

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 86%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 16.9 |  | mg/kg | 0.464 | -- | 1 | 11/02/17 22:55 | 11/09/17 19:15 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|



**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-09

Date Collected: 08/15/17 00:00

Client ID: TP-3 10"-3'2"

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 85%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Prep<br>Method | Analytical<br>Method | Analyst |
|-----------|--------|-----------|-------|----|-----|--------------------|------------------|------------------|----------------|----------------------|---------|
|-----------|--------|-----------|-------|----|-----|--------------------|------------------|------------------|----------------|----------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 40.2 |  | mg/kg | 0.455 | -- | 1 | 11/02/17 22:55 | 11/09/17 19:20 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|



**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-10

Date Collected: 08/15/17 00:00

Client ID: TP-4 1'4"-2'6"

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 96%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 35.8 |  | mg/kg | 0.400 | -- | 1 | 11/02/17 22:55 | 11/09/17 19:25 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|



**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-11

Date Collected: 08/14/17 00:00

Client ID: TP-5 11"-2'

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 91%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 35.1 |  | mg/kg | 0.433 | -- | 1 | 11/02/17 22:55 | 11/09/17 19:30 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|



**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-12

Date Collected: 08/14/17 00:00

Client ID: TP-6 0"-10"

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 79%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 35.1 |  | mg/kg | 0.492 | -- | 1 | 11/02/17 22:55 | 11/09/17 19:34 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|





**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-13

Date Collected: 08/14/17 00:00

Client ID: TP-7 7"-18"

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 90%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Prep<br>Method | Analytical<br>Method | Analyst |
|-----------|--------|-----------|-------|----|-----|--------------------|------------------|------------------|----------------|----------------------|---------|
|-----------|--------|-----------|-------|----|-----|--------------------|------------------|------------------|----------------|----------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 42.1 |  | mg/kg | 0.428 | -- | 1 | 11/02/17 22:55 | 11/09/17 19:39 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|



**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-14

Date Collected: 08/14/17 00:00

Client ID: TP-8 8"-2'2"

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 90%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 37.6 |  | mg/kg | 0.439 | -- | 1 | 11/02/17 22:55 | 11/09/17 19:44 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|



**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**SAMPLE RESULTS**

Lab ID: L1739826-15

Date Collected: 08/14/17 00:00

Client ID: TP-10 7"-2'

Date Received: 11/01/17

Sample Location: Not Specified

Field Prep: Not Specified

Matrix: Soil

Percent Solids: 92%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|
|-----------|--------|-----------|-------|----|-----|-----------------|---------------|---------------|-------------|-------------------|---------|

**MCP Total Metals - Mansfield Lab**

|                |      |  |       |       |    |   |                |                |           |          |    |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|
| Arsenic, Total | 33.1 |  | mg/kg | 0.410 | -- | 1 | 11/02/17 22:55 | 11/09/17 19:49 | EPA 3050B | 97,6010C | AB |
|----------------|------|--|-------|-------|----|---|----------------|----------------|-----------|----------|----|



Project Name: VEC-WORCESTER SOUTH

Lab Number: L1739826

Project Number: 2604

Report Date: 11/10/17

## Method Blank Analysis Batch Quality Control

| Parameter  | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| MCP Total Metals - Mansfield Lab for sample(s): 01-15 Batch: WG1059096-1 |        |           |       |       |     |                    |                  |                  |                      |         |
| Arsenic, Total   | ND     |           | mg/kg | 0.400 | --  | 1                  | 11/02/17 22:55   | 11/09/17 18:19   | 97,6010C             | AB      |

### Prep Information

Digestion Method: EPA 3050B

**Lab Control Sample Analysis****Batch Quality Control****Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17

| Parameter  | LCS<br>%Recovery | Qual | LCSD<br>%Recovery | Qual | %Recovery<br>Limits | RPD | Qual | RPD Limits |
|--|------------------|------|-------------------|------|---------------------|-----|------|------------|
| MCP Total Metals - Mansfield Lab Associated sample(s): 01-15 Batch: WG1059096-2 WG1059096-3 SRM Lot Number: D098-540 |                  |      |                   |      |                     |     |      |            |
| Arsenic, Total   | 97               |      | 100               |      | 83-117              | 3   |      | 30         |

# **INORGANICS & MISCELLANEOUS**

**Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17**SAMPLE RESULTS****Lab ID:** L1739826-01**Client ID:** B-1 0'-2'**Sample Location:** Not Specified**Matrix:** Soil**Date Collected:** 08/11/17 00:00**Date Received:** 11/01/17**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 84.6   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 00:45   | 121,2540G            | FN      |



**Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17**SAMPLE RESULTS****Lab ID:** L1739826-02**Client ID:** B-2 0'-2'**Sample Location:** Not Specified**Matrix:** Soil**Date Collected:** 08/10/17 00:00**Date Received:** 11/01/17**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 80.0   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 00:45   | 121,2540G            | FN      |





**Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17**SAMPLE RESULTS****Lab ID:** L1739826-03**Client ID:** B-3 0'-2'**Sample Location:** Not Specified**Matrix:** Soil**Date Collected:** 08/11/17 00:00**Date Received:** 11/01/17**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 86.4   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 00:45   | 121,2540G            | FN      |



**Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17**SAMPLE RESULTS****Lab ID:** L1739826-04**Client ID:** B-4 0'-2'**Sample Location:** Not Specified**Matrix:** Soil**Date Collected:** 08/10/17 00:00**Date Received:** 11/01/17**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 86.6   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 00:45   | 121,2540G            | FN      |



**Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17**SAMPLE RESULTS****Lab ID:** L1739826-05**Client ID:** B-5 0'-2'**Sample Location:** Not Specified**Matrix:** Soil**Date Collected:** 08/10/17 00:00**Date Received:** 11/01/17**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 86.9   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 00:45   | 121,2540G            | FN      |



**Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17**SAMPLE RESULTS****Lab ID:** L1739826-06**Client ID:** B-6 0'-2'**Sample Location:** Not Specified**Matrix:** Soil**Date Collected:** 08/10/17 00:00**Date Received:** 11/01/17**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 85.6   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 00:45   | 121,2540G            | FN      |



Project Name: VEC-WORCESTER SOUTH

Project Number: 2604

Lab Number: L1739826

Report Date: 11/10/17

**SAMPLE RESULTS**

Lab ID: L1739826-07

Client ID: B-7 0'-2'

Sample Location: Not Specified

Matrix: Soil

Date Collected: 08/11/17 00:00

Date Received: 11/01/17

Field Prep: Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 84.5   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 00:45   | 121,2540G            | FN      |



**Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17**SAMPLE RESULTS****Lab ID:** L1739826-08**Client ID:** B-8 0.5'-2'**Sample Location:** Not Specified**Matrix:** Soil**Date Collected:** 08/11/17 00:00**Date Received:** 11/01/17**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 86.1   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 00:45   | 121,2540G            | FN      |



**Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17**SAMPLE RESULTS****Lab ID:** L1739826-09**Client ID:** TP-3 10"-3'2"**Sample Location:** Not Specified**Matrix:** Soil**Date Collected:** 08/15/17 00:00**Date Received:** 11/01/17**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 84.8   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 11:06   | 121,2540G            | RI      |



**Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17**SAMPLE RESULTS****Lab ID:** L1739826-10**Client ID:** TP-4 1'4"-2'6"**Sample Location:** Not Specified**Matrix:** Soil**Date Collected:** 08/15/17 00:00**Date Received:** 11/01/17**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 95.7   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 11:06   | 121,2540G            | RI      |





**Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17**SAMPLE RESULTS****Lab ID:** L1739826-11**Client ID:** TP-5 11"-2'**Sample Location:** Not Specified**Matrix:** Soil**Date Collected:** 08/14/17 00:00**Date Received:** 11/01/17**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 91.4   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 00:45   | 121,2540G            | FN      |



Project Name: VEC-WORCESTER SOUTH

Project Number: 2604

Lab Number: L1739826

Report Date: 11/10/17

**SAMPLE RESULTS**

Lab ID: L1739826-12

Client ID: TP-6 0"-10"

Sample Location: Not Specified

Matrix: Soil

Date Collected: 08/14/17 00:00

Date Received: 11/01/17

Field Prep: Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 79.3   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 00:45   | 121,2540G            | FN      |



**Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17**SAMPLE RESULTS****Lab ID:** L1739826-13**Client ID:** TP-7 7"-18"**Sample Location:** Not Specified**Matrix:** Soil**Date Collected:** 08/14/17 00:00**Date Received:** 11/01/17**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 90.3   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 00:45   | 121,2540G            | FN      |



**Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17**SAMPLE RESULTS****Lab ID:** L1739826-14**Client ID:** TP-8 8"-2'2"**Sample Location:** Not Specified**Matrix:** Soil**Date Collected:** 08/14/17 00:00**Date Received:** 11/01/17**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 90.3   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 00:45   | 121,2540G            | FN      |



**Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17**SAMPLE RESULTS****Lab ID:** L1739826-15**Client ID:** TP-10 7"-2'**Sample Location:** Not Specified**Matrix:** Soil**Date Collected:** 08/14/17 00:00**Date Received:** 11/01/17**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 92.3   |           | %     | 0.100 | NA  | 1                  | -                | 11/08/17 00:45   | 121,2540G            | FN      |



**Lab Duplicate Analysis**  
Batch Quality Control**Project Name:** VEC-WORCESTER SOUTH**Project Number:** 2604**Lab Number:** L1739826**Report Date:** 11/10/17

| Parameter  | Native Sample | Duplicate Sample | Units | RPD | Qual | RPD Limits |
|--|---------------|------------------|-------|-----|------|------------|
| General Chemistry - Westborough Lab Associated sample(s): 09-10 QC Batch ID: WG1060864-1 QC Sample: L1739826-09 Client ID: TP-3 10"-3'2" |               |                  |       |     |      |            |
| Solids, Total  | 84.8          | 85.0             | %     | 0   |      | 20         |

**Project Name:** VEC-WORCESTER SOUTH**Lab Number:** L1739826**Project Number:** 2604**Report Date:** 11/10/17**Sample Receipt and Container Information**

Were project specific reporting limits specified?

YES

**Cooler Information**

|               |                     |
|---------------|---------------------|
| <b>Cooler</b> | <b>Custody Seal</b> |
| A             | Absent              |

**Container Information**

| <b>Container ID</b> | <b>Container Type</b>        | <b>Cooler</b> | <b>Initial pH</b> | <b>Final pH</b> | <b>Temp deg C</b> | <b>Pres</b> | <b>Seal</b> | <b>Frozen Date/Time</b> | <b>Analysis(*)</b>   |
|---------------------|------------------------------|---------------|-------------------|-----------------|-------------------|-------------|-------------|-------------------------|----------------------|
| L1739826-01A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.3               | Y           | Absent      |                         | MCP-AS-6010T-10(180) |
| L1739826-01B        | Glass 120ml/4oz unpreserved  | A             | NA                |                 | 3.3               | Y           | Absent      |                         | TS(7)                |
| L1739826-02A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.3               | Y           | Absent      |                         | MCP-AS-6010T-10(180) |
| L1739826-02B        | Glass 120ml/4oz unpreserved  | A             | NA                |                 | 3.3               | Y           | Absent      |                         | TS(7)                |
| L1739826-03A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.3               | Y           | Absent      |                         | MCP-AS-6010T-10(180) |
| L1739826-03B        | Glass 120ml/4oz unpreserved  | A             | NA                |                 | 3.3               | Y           | Absent      |                         | TS(7)                |
| L1739826-04A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.3               | Y           | Absent      |                         | MCP-AS-6010T-10(180) |
| L1739826-04B        | Glass 120ml/4oz unpreserved  | A             | NA                |                 | 3.3               | Y           | Absent      |                         | TS(7)                |
| L1739826-05A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.3               | Y           | Absent      |                         | MCP-AS-6010T-10(180) |
| L1739826-05B        | Glass 120ml/4oz unpreserved  | A             | NA                |                 | 3.3               | Y           | Absent      |                         | TS(7)                |
| L1739826-06A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.3               | Y           | Absent      |                         | MCP-AS-6010T-10(180) |
| L1739826-06B        | Glass 120ml/4oz unpreserved  | A             | NA                |                 | 3.3               | Y           | Absent      |                         | TS(7)                |
| L1739826-07A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.3               | Y           | Absent      |                         | MCP-AS-6010T-10(180) |
| L1739826-07B        | Glass 120ml/4oz unpreserved  | A             | NA                |                 | 3.3               | Y           | Absent      |                         | TS(7)                |
| L1739826-08A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.3               | Y           | Absent      |                         | MCP-AS-6010T-10(180) |
| L1739826-08B        | Glass 120ml/4oz unpreserved  | A             | NA                |                 | 3.3               | Y           | Absent      |                         | TS(7)                |
| L1739826-09A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.3               | Y           | Absent      |                         | MCP-AS-6010T-10(180) |
| L1739826-09B        | Glass 120ml/4oz unpreserved  | A             | NA                |                 | 3.3               | Y           | Absent      |                         | TS(7)                |
| L1739826-10A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.3               | Y           | Absent      |                         | MCP-AS-6010T-10(180) |
| L1739826-10B        | Glass 120ml/4oz unpreserved  | A             | NA                |                 | 3.3               | Y           | Absent      |                         | TS(7)                |
| L1739826-11A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.3               | Y           | Absent      |                         | MCP-AS-6010T-10(180) |
| L1739826-11B        | Glass 120ml/4oz unpreserved  | A             | NA                |                 | 3.3               | Y           | Absent      |                         | TS(7)                |
| L1739826-12A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.3               | Y           | Absent      |                         | MCP-AS-6010T-10(180) |

**Project Name:** VEC-WORCESTER SOUTH  
**Project Number:** 2604

Serial\_No:11101713:09  
**Lab Number:** L1739826  
**Report Date:** 11/10/17

**Container Information**

| <b>Container ID</b> | <b>Container Type</b>        | <b>Cooler</b> | <b>Initial<br/>pH</b> | <b>Final<br/>pH</b> | <b>Temp<br/>deg C</b> | <b>Pres</b> | <b>Seal</b> | <b>Frozen<br/>Date/Time</b> | <b>Analysis(*)</b>   |
|---------------------|------------------------------|---------------|-----------------------|---------------------|-----------------------|-------------|-------------|-----------------------------|----------------------|
| L1739826-12B        | Glass 120ml/4oz unpreserved  | A             | NA                    |                     | 3.3                   | Y           | Absent      |                             | TS(7)                |
| L1739826-13A        | Glass 60ml unpreserved split | A             | NA                    |                     | 3.3                   | Y           | Absent      |                             | MCP-AS-6010T-10(180) |
| L1739826-13B        | Glass 120ml/4oz unpreserved  | A             | NA                    |                     | 3.3                   | Y           | Absent      |                             | TS(7)                |
| L1739826-14A        | Glass 60ml unpreserved split | A             | NA                    |                     | 3.3                   | Y           | Absent      |                             | MCP-AS-6010T-10(180) |
| L1739826-14B        | Glass 120ml/4oz unpreserved  | A             | NA                    |                     | 3.3                   | Y           | Absent      |                             | TS(7)                |
| L1739826-15A        | Glass 60ml unpreserved split | A             | NA                    |                     | 3.3                   | Y           | Absent      |                             | MCP-AS-6010T-10(180) |
| L1739826-15B        | Glass 120ml/4oz unpreserved  | A             | NA                    |                     | 3.3                   | Y           | Absent      |                             | TS(7)                |



**Project Name:** VEC-WORCESTER SOUTH  
**Project Number:** 2604

**Lab Number:** L1739826  
**Report Date:** 11/10/17

## GLOSSARY

### Acronyms

|          |   |
|----------|---|
| EDL      | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).                        |
| EPA      | - Environmental Protection Agency.  |
| LCS      | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.   |
| LCSD     | - Laboratory Control Sample Duplicate: Refer to LCS.  |
| LFB      | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.  |
| MDL      | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.   |
| MS       | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.  |
| MSD      | - Matrix Spike Sample Duplicate: Refer to MS.   |
| NA       | - Not Applicable.   |
| NC       | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.  |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine.   |
| NI       | - Not Ignitable.  |
| NP       | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.   |
| RL       | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.  |
| RPD      | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM      | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.  |
| STLP     | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.   |
| TIC      | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.   |

### Footnotes

- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

### Terms

**Analytical Method:** Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

**Final pH:** As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

**Frozen Date/Time:** With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

**Initial pH:** As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

**Total:** With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

### Data Qualifiers

- A** - Spectra identified as "Aldol Condensation Product".
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related

**Report Format:** Data Usability Report



**Project Name:** VEC-WORCESTER SOUTH  
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#### Data Qualifiers

projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.
- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.
- J** - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
- ND** - Not detected at the reporting limit (RL) for the sample.

**Project Name:** VEC-WORCESTER SOUTH  
**Project Number:** 2604

**Lab Number:** L1739826  
**Report Date:** 11/10/17

## REFERENCES

- 97 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA, IIB, IIIA, IIIB, IIIC, IIID, VA, VB, VC, VIA, VIB, VIIIA and VIIIB, July 2010.
- 121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



**Alpha Analytical, Inc.**

ID No.:17873

Facility: **Company-wide**

Revision 10

Department: **Quality Assurance**

Published Date: 1/16/2017 11:00:05 AM

Title: **Certificate/Approval Program Summary**

Page 1 of 1

**Certification Information**

The following analytes are not included in our Primary NELAP Scope of Accreditation:

**Westborough Facility****EPA 624:** m/p-xylene, o-xylene**EPA 8260C:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.**EPA 8270D:** NPW: Dimethylnaphthalene, 1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene, 1,4-Diphenylhydrazine.**EPA 300:** DW: Bromide**EPA 6860:** NPW and SCM: Perchlorate**EPA 9010:** NPW and SCM: Amenable Cyanide Distillation**EPA 9012B:** NPW: Total Cyanide**EPA 9050A:** NPW: Specific Conductance**SM3500:** NPW: Ferrous Iron**SM4500:** NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO<sub>2</sub>, NO<sub>3</sub>.**SM5310C:** DW: Dissolved Organic Carbon**Mansfield Facility****SM 2540D:** TSS**EPA 3005A** NPW**EPA 8082A:** NPW: PCB: 1, 5, 31, 87, 101, 110, 141, 151, 153, 180, 183, 187.**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.**Biological Tissue Matrix:** EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

**Westborough Facility:****Drinking Water****EPA 300.0:** Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500CI-D, SM2320B, SM2540C, SM4500H-B****EPA 332:** Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.**Microbiology:** **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, SM9222D.****Non-Potable Water****SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH, EPA 350.1:** Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **SM4500NO3-F, EPA 353.2:** Nitrate-N, **EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.****EPA 624:** Volatile Halocarbons & Aromatics,**EPA 608:** Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs**EPA 625:** SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045:** PCB-Oil.**Microbiology:** **SM9223B-Colilert-QT; Enterolert-QT, SM9221E.****Mansfield Facility:****Drinking Water****EPA 200.7:** Ba, Be, Cd, Cr, Cu, Ni, Na, Ca. **EPA 200.8:** Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, TL. **EPA 245.1 Hg.****Non-Potable Water****EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.**EPA 200.8:** Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn.**EPA 245.1 Hg.****SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

## PAGE 1 OF 2

320 Forbes Blvd  
Mansfield, MA 02048  
Tel: 508-822-9300

Project Name: VEC - Worcester South

Project #: 2604

Project Manager: Jon P. Lister

### Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved)

Date Rec'd in Lab: 11/11/17

ALPHA Job #: 21739826

☒ ADEX ☐ EMAIL☐ Same as Client info      PO #:

## Regulatory Requirements &amp; Project Information Requirements

☒ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods  
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)  
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)  
☐ Yes ☐ No NPDES RGP  
☐ Other State /Fed Program MA DEP Criteria S-1

### Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved)

| ANALYSIS  |  | SAMPLE INFO                        |  |
|---|--|------------------------------------|--|
| VOC: <input type="checkbox"/> 8260 <input type="checkbox"/> 624 <input type="checkbox"/> 524.2          |  | Filtration                         |  |
| SVOC: <input type="checkbox"/> ABN <input type="checkbox"/> PAH   |  | <input type="checkbox"/> Field     |  |
| METALS: <input type="checkbox"/> MCP 13 <input type="checkbox"/> MCP 14 <input type="checkbox"/> MCP 15 |  | <input type="checkbox"/> Lab to do |  |
| EPH: <input type="checkbox"/> RCRA5 <input type="checkbox"/> RCRA8 <input type="checkbox"/> PP13        |  | Preservation                       |  |
| VPH: <input type="checkbox"/> Ranges & Targets <input type="checkbox"/> Ranges Only                     |  | <input type="checkbox"/> Lab to do |  |
| <input type="checkbox"/> PCB <input type="checkbox"/> PEST  |  |                                    |  |
| TPH: <input type="checkbox"/> Quant Only <input type="checkbox"/> Fingerprint                           |  |                                    |  |
| Abnric  |  | Sample Comments                    |  |

*Preservation*  
☐ Lab to do

### Sample Comments

TOTAL # BOTTLES

| Container type  | Preservative                         |
|-----------------|--------------------------------------|
| P= Plastic      | A= None                              |
| A= Amber glass  | B= HCl                               |
| V= Vial         | C= $\text{HNO}_3$                    |
| G= Glass        | D= $\text{H}_2\text{SO}_4$           |
| B= Bacteria cup | E= NaOH                              |
| C= Cube         | F= MeOH                              |
| O= Other        | G= $\text{NaHSO}_4$                  |
| E= Encore       | H= $\text{Na}_2\text{S}_2\text{O}_3$ |
| D= BOD Bottle   | I= Ascorbic acid                     |

Container Type

Preservative

Relinquished By:

Date/Time

Received By:

Date/Time

All samples submitted are subject to Alpha's Terms and Conditions.  
See reverse side.

FORM NO. 01-01 (rev. 12-Mar-2012)





# **APPENDIX F**

## **ARSENIC ANALYTICAL REPORT - DEEP**

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## ANALYTICAL REPORT

|                 |  |
|-----------------|--|
| Lab Number:     | L1807951   |
| Client:         | Lord Associates, Inc.<br>1506 Providence Highway - Suite 30<br>Norwood, MA 02062 |
| ATTN:           | Ralph Tella  |
| Phone:          | (781) 255-5554   |
| Project Name:   | WORC. SO   |
| Project Number: | 2604   |
| Report Date:    | 03/15/18   |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), NJ NELAP (MA935), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-14-00197).

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Eight Walkup Drive, Westborough, MA 01581-1019  
508-898-9220 (Fax) 508-898-9193 800-624-9220 - [www.alphalab.com](http://www.alphalab.com)



**Project Name:** WORC. SO  
**Project Number:** 2604

**Lab Number:** L1807951  
**Report Date:** 03/15/18

| Alpha<br>Sample ID | Client ID        | Matrix | Sample<br>Location | Collection<br>Date/Time | Receive Date |
|--------------------|------------------|--------|--------------------|-------------------------|--------------|
| L1807951-01        | B-114, 4-6'      | SOIL   | BORINGS            | 03/02/18 00:00          | 03/08/18     |
| L1807951-02        | B-120A, 8-10'    | SOIL   | BORINGS            | 03/02/18 00:00          | 03/08/18     |
| L1807951-03        | B-116, 19-21'    | SOIL   | BORINGS            | 03/02/18 00:00          | 03/08/18     |
| L1807951-04        | B-12, 6-8'       | SOIL   | BORINGS            | 03/02/18 00:00          | 03/08/18     |
| L1807951-05        | B-118B, 24-26'   | SOIL   | BORINGS            | 03/02/18 00:00          | 03/08/18     |
| L1807951-06        | B-119A, 8-10'    | SOIL   | BORINGS            | 03/02/18 00:00          | 03/08/18     |
| L1807951-07        | B-119A, 24-25.7' | SOIL   | BORINGS            | 03/02/18 00:00          | 03/08/18     |
| L1807951-08        | B-117B, 8-10'    | SOIL   | BORINGS            | 03/02/18 00:00          | 03/08/18     |
| L1807951-09        | B-117B, 19-21'   | SOIL   | BORINGS            | 03/02/18 00:00          | 03/08/18     |

**Project Name:** WORC. SO  
**Project Number:** 2604

**Lab Number:** L1807951  
**Report Date:** 03/15/18

### Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

#### HOLD POLICY

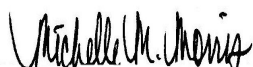
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

---

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:

 Michelle M. Morris

Title: Technical Director/Representative

Date: 03/15/18

## METALS

Project Name: WORC. SO

Lab Number: L1807951

Project Number: 2604

Report Date: 03/15/18

**SAMPLE RESULTS**

Lab ID: L1807951-01

Date Collected: 03/02/18 00:00

Client ID: B-114, 4-6'

Date Received: 03/08/18

Sample Location: BORINGS

Field Prep: Not Specified

Sample Depth:

Matrix: Soil

Percent Solids: 90%

| Parameter                    | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Prep<br>Method | Analytical<br>Method | Analyst |
|------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------|----------------------|---------|
| Total Metals - Mansfield Lab |        |           |       |       |     |                    |                  |                  |                |                      |         |
| Arsenic, Total               | 35.8   |           | mg/kg | 0.436 | --  | 1                  | 03/14/18 19:26   | 03/14/18 23:32   | EPA 3050B      | 1,6010C              | AB      |



Project Name: WORC. SO

Lab Number: L1807951

Project Number: 2604

Report Date: 03/15/18

**SAMPLE RESULTS**

Lab ID: L1807951-02

Date Collected: 03/02/18 00:00

Client ID: B-120A, 8-10'

Date Received: 03/08/18

Sample Location: BORINGS

Field Prep: Not Specified

Sample Depth:

Matrix: Soil

Percent Solids: 87%

| Parameter                    | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Prep<br>Method | Analytical<br>Method | Analyst |
|------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------|----------------------|---------|
| Total Metals - Mansfield Lab |        |           |       |       |     |                    |                  |                  |                |                      |         |
| Arsenic, Total               | 39.7   |           | mg/kg | 0.450 | --  | 1                  | 03/14/18 19:26   | 03/14/18 23:36   | EPA 3050B      | 1,6010C              | AB      |



Project Name: WORC. SO

Lab Number: L1807951

Project Number: 2604

Report Date: 03/15/18

**SAMPLE RESULTS**

Lab ID: L1807951-03

Date Collected: 03/02/18 00:00

Client ID: B-116, 19-21'

Date Received: 03/08/18

Sample Location: BORINGS

Field Prep: Not Specified

Sample Depth:

Matrix: Soil

Percent Solids: 90%

| Parameter                    | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Prep<br>Method | Analytical<br>Method | Analyst |
|------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------|----------------------|---------|
| Total Metals - Mansfield Lab |        |           |       |       |     |                    |                  |                  |                |                      |         |
| Arsenic, Total               | 16.2   |           | mg/kg | 0.432 | --  | 1                  | 03/14/18 19:26   | 03/14/18 23:41   | EPA 3050B      | 1,6010C              | AB      |



Project Name: WORC. SO

Lab Number: L1807951

Project Number: 2604

Report Date: 03/15/18

**SAMPLE RESULTS**

Lab ID: L1807951-04

Date Collected: 03/02/18 00:00

Client ID: B-12, 6-8'

Date Received: 03/08/18

Sample Location: BORINGS

Field Prep: Not Specified

Sample Depth:

Matrix: Soil

Percent Solids: 89%

| Parameter                    | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Prep<br>Method | Analytical<br>Method | Analyst |
|------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------|----------------------|---------|
| Total Metals - Mansfield Lab |        |           |       |       |     |                    |                  |                  |                |                      |         |
| Arsenic, Total               | 61.3   |           | mg/kg | 0.434 | --  | 1                  | 03/14/18 19:26   | 03/14/18 23:58   | EPA 3050B      | 1,6010C              | AB      |





Project Name: WORC. SO

Lab Number: L1807951

Project Number: 2604

Report Date: 03/15/18

**SAMPLE RESULTS**

Lab ID: L1807951-05

Date Collected: 03/02/18 00:00

Client ID: B-118B, 24-26'

Date Received: 03/08/18

Sample Location: BORINGS

Field Prep: Not Specified

Sample Depth:

Matrix: Soil

Percent Solids: 90%

| Parameter                    | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Prep<br>Method | Analytical<br>Method | Analyst |
|------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------|----------------------|---------|
| Total Metals - Mansfield Lab |        |           |       |       |     |                    |                  |                  |                |                      |         |
| Arsenic, Total               | 13.4   |           | mg/kg | 0.428 | --  | 1                  | 03/14/18 19:26   | 03/15/18 00:02   | EPA 3050B      | 1,6010C              | AB      |



Project Name: WORC. SO

Lab Number: L1807951

Project Number: 2604

Report Date: 03/15/18

**SAMPLE RESULTS**

Lab ID: L1807951-06

Date Collected: 03/02/18 00:00

Client ID: B-119A, 8-10'

Date Received: 03/08/18

Sample Location: BORINGS

Field Prep: Not Specified

Sample Depth:

Matrix: Soil

Percent Solids: 88%

| Parameter                    | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Prep<br>Method | Analytical<br>Method | Analyst |
|------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------|----------------------|---------|
| Total Metals - Mansfield Lab |        |           |       |       |     |                    |                  |                  |                |                      |         |
| Arsenic, Total               | 41.4   |           | mg/kg | 0.443 | --  | 1                  | 03/14/18 19:26   | 03/15/18 00:07   | EPA 3050B      | 1,6010C              | AB      |



Project Name: WORC. SO

Lab Number: L1807951

Project Number: 2604

Report Date: 03/15/18

## SAMPLE RESULTS

Lab ID: L1807951-07

Date Collected: 03/02/18 00:00

Client ID: B-119A, 24-25.7'

Date Received: 03/08/18

Sample Location: BORINGS

Field Prep: Not Specified

Sample Depth:

Matrix: Soil

Percent Solids: 89%

| Parameter                    | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Prep<br>Method | Analytical<br>Method | Analyst |
|------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------|----------------------|---------|
| Total Metals - Mansfield Lab |        |           |       |       |     |                    |                  |                  |                |                      |         |
| Arsenic, Total               | 70.4   |           | mg/kg | 0.434 | --  | 1                  | 03/14/18 19:26   | 03/15/18 00:11   | EPA 3050B      | 1,6010C              | AB      |



Project Name: WORC. SO

Lab Number: L1807951

Project Number: 2604

Report Date: 03/15/18

## SAMPLE RESULTS

Lab ID: L1807951-08

Date Collected: 03/02/18 00:00

Client ID: B-117B, 8-10'

Date Received: 03/08/18

Sample Location: BORINGS

Field Prep: Not Specified

Sample Depth:

Matrix: Soil

Percent Solids: 87%

| Parameter                    | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Prep<br>Method | Analytical<br>Method | Analyst |
|------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------|----------------------|---------|
| Total Metals - Mansfield Lab |        |           |       |       |     |                    |                  |                  |                |                      |         |
| Arsenic, Total               | 47.2   |           | mg/kg | 0.436 | --  | 1                  | 03/14/18 19:26   | 03/15/18 00:15   | EPA 3050B      | 1,6010C              | AB      |



Project Name: WORC. SO

Lab Number: L1807951

Project Number: 2604

Report Date: 03/15/18

**SAMPLE RESULTS**

Lab ID: L1807951-09

Date Collected: 03/02/18 00:00

Client ID: B-117B, 19-21'

Date Received: 03/08/18

Sample Location: BORINGS

Field Prep: Not Specified

Sample Depth:

Matrix: Soil

Percent Solids: 90%

| Parameter                    | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Prep<br>Method | Analytical<br>Method | Analyst |
|------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------|----------------------|---------|
| Total Metals - Mansfield Lab |        |           |       |       |     |                    |                  |                  |                |                      |         |
| Arsenic, Total               | 16.7   |           | mg/kg | 0.425 | --  | 1                  | 03/14/18 19:26   | 03/15/18 00:20   | EPA 3050B      | 1,6010C              | AB      |



Project Name: WORC. SO

Lab Number: L1807951

Project Number: 2604

Report Date: 03/15/18

## Method Blank Analysis Batch Quality Control

| Parameter  | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|--|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| Total Metals - Mansfield Lab for sample(s): 01-09 Batch: WG1097091-1 |        |           |       |       |     |                    |                  |                  |                      |         |
| Arsenic, Total   | ND     |           | mg/kg | 0.400 | --  | 1                  | 03/14/18 19:26   | 03/14/18 22:17   | 1,6010C              | AB      |

### Prep Information

Digestion Method: EPA 3050B

## Lab Control Sample Analysis

### Batch Quality Control

Project Name: WORC. SO

Project Number: 2604

Lab Number: L1807951

Report Date: 03/15/18

| Parameter  | LCS<br>%Recovery | Qual | LCSD<br>%Recovery | Qual | %Recovery<br>Limits | RPD | Qual | RPD Limits |
|--|------------------|------|-------------------|------|---------------------|-----|------|------------|
| Total Metals - Mansfield Lab Associated sample(s): 01-09 Batch: WG1097091-2 SRM Lot Number: D098-540 |                  |      |                   |      |                     |     |      |            |
| Arsenic, Total   | 102              |      | -                 |      | 83-117              | -   |      |            |

# **Matrix Spike Analysis** Batch Quality Control

**Project Name:** WORC. SO

**Project Number:** 2604

**Lab Number:** L1807951

**Report Date:** 03/15/18

| Parameter  | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|--|---------------|----------|----------|--------------|------|-----------|---------------|------|-----------------|-----|------|------------|
| Total Metals - Mansfield Lab Associated sample(s): 01-09    QC Batch ID: WG1097091-3    QC Sample: L1808457-01    Client ID: MS Sample |               |          |          |              |      |           |               |      |                 |     |      |            |
| Arsenic, Total   | 1.50          | 10.8     | 12.2     | 99           |      | -         | -             |      | 75-125          | -   |      | 20         |



Project Name: WORC. SO

Project Number: 2604

**Lab Duplicate Analysis**  
Batch Quality Control

Lab Number: L1807951

Report Date: 03/15/18

| Parameter  | Native Sample | Duplicate Sample | Units | RPD | Qual | RPD Limits |
|--|---------------|------------------|-------|-----|------|------------|
| Total Metals - Mansfield Lab Associated sample(s): 01-09 QC Batch ID: WG1097091-4 QC Sample: L1808457-01 Client ID: DUP Sample |               |                  |       |     |      |            |
| Arsenic, Total   | 1.50          | 1.59             | mg/kg | 6   |      | 20         |

# **INORGANICS & MISCELLANEOUS**

Project Name: WORC. SO

Project Number: 2604

Lab Number: L1807951

Report Date: 03/15/18

## SAMPLE RESULTS

Lab ID: L1807951-01

Client ID: B-114, 4-6'

Sample Location: BORINGS

Sample Depth:

Matrix: Soil

Date Collected: 03/02/18 00:00

Date Received: 03/08/18

Field Prep: Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 89.7   |           | %     | 0.100 | NA  | 1                  | -                | 03/09/18 11:29   | 121,2540G            | RI      |



Project Name: WORC. SO

Project Number: 2604

Lab Number: L1807951

Report Date: 03/15/18

**SAMPLE RESULTS**

Lab ID: L1807951-02

Client ID: B-120A, 8-10'

Sample Location: BORINGS

Sample Depth:

Matrix: Soil

Date Collected: 03/02/18 00:00

Date Received: 03/08/18

Field Prep: Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 86.8   |           | %     | 0.100 | NA  | 1                  | -                | 03/09/18 11:29   | 121,2540G            | RI      |

Project Name: WORC. SO

Project Number: 2604

Lab Number: L1807951

Report Date: 03/15/18

**SAMPLE RESULTS**

Lab ID: L1807951-03

Client ID: B-116, 19-21'

Sample Location: BORINGS

Sample Depth:

Matrix: Soil

Date Collected: 03/02/18 00:00

Date Received: 03/08/18

Field Prep: Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 89.6   |           | %     | 0.100 | NA  | 1                  | -                | 03/09/18 11:29   | 121,2540G            | RI      |



**Project Name:** WORC. SO**Project Number:** 2604**Lab Number:** L1807951**Report Date:** 03/15/18**SAMPLE RESULTS****Lab ID:** L1807951-04**Client ID:** B-12, 6-8'**Sample Location:** BORINGS**Sample Depth:****Matrix:** Soil**Date Collected:** 03/02/18 00:00**Date Received:** 03/08/18**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 89.3   |           | %     | 0.100 | NA  | 1                  | -                | 03/09/18 11:29   | 121,2540G            | RI      |



**Project Name:** WORC. SO**Project Number:** 2604**Lab Number:** L1807951**Report Date:** 03/15/18**SAMPLE RESULTS****Lab ID:** L1807951-05**Client ID:** B-118B, 24-26'**Sample Location:** BORINGS**Sample Depth:****Matrix:** Soil**Date Collected:** 03/02/18 00:00**Date Received:** 03/08/18**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 89.8   |           | %     | 0.100 | NA  | 1                  | -                | 03/09/18 11:29   | 121,2540G            | RI      |



Project Name: WORC. SO

Project Number: 2604

Lab Number: L1807951

Report Date: 03/15/18

## SAMPLE RESULTS

Lab ID: L1807951-06

Client ID: B-119A, 8-10'

Sample Location: BORINGS

Sample Depth:

Matrix: Soil

Date Collected: 03/02/18 00:00

Date Received: 03/08/18

Field Prep: Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 87.6   |           | %     | 0.100 | NA  | 1                  | -                | 03/09/18 11:29   | 121,2540G            | RI      |





Project Name: WORC. SO

Project Number: 2604

Lab Number: L1807951

Report Date: 03/15/18

## SAMPLE RESULTS

Lab ID: L1807951-07

Client ID: B-119A, 24-25.7'

Sample Location: BORINGS

Sample Depth:

Matrix: Soil

Date Collected: 03/02/18 00:00

Date Received: 03/08/18

Field Prep: Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 89.2   |           | %     | 0.100 | NA  | 1                  | -                | 03/09/18 11:29   | 121,2540G            | RI      |



**Project Name:** WORC. SO**Project Number:** 2604**Lab Number:** L1807951**Report Date:** 03/15/18**SAMPLE RESULTS****Lab ID:** L1807951-08**Client ID:** B-117B, 8-10'**Sample Location:** BORINGS**Sample Depth:****Matrix:** Soil**Date Collected:** 03/02/18 00:00**Date Received:** 03/08/18**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 86.6   |           | %     | 0.100 | NA  | 1                  | -                | 03/09/18 11:29   | 121,2540G            | RI      |



**Project Name:** WORC. SO**Project Number:** 2604**Lab Number:** L1807951**Report Date:** 03/15/18**SAMPLE RESULTS****Lab ID:** L1807951-09**Client ID:** B-117B, 19-21'**Sample Location:** BORINGS**Sample Depth:****Matrix:** Soil**Date Collected:** 03/02/18 00:00**Date Received:** 03/08/18**Field Prep:** Not Specified

| Parameter                           | Result | Qualifier | Units | RL    | MDL | Dilution<br>Factor | Date<br>Prepared | Date<br>Analyzed | Analytical<br>Method | Analyst |
|-------------------------------------|--------|-----------|-------|-------|-----|--------------------|------------------|------------------|----------------------|---------|
| General Chemistry - Westborough Lab |        |           |       |       |     |                    |                  |                  |                      |         |
| Solids, Total                       | 90.3   |           | %     | 0.100 | NA  | 1                  | -                | 03/09/18 11:29   | 121,2540G            | RI      |



Project Name: WORC. SO

Project Number: 2604

**Lab Duplicate Analysis**  
Batch Quality Control

Lab Number: L1807951

Report Date: 03/15/18

| Parameter   | Native Sample | Duplicate Sample | Units | RPD | Qual | RPD Limits |
|---|---------------|------------------|-------|-----|------|------------|
| General Chemistry - Westborough Lab Associated sample(s): 01-09 QC Batch ID: WG1095922-1 QC Sample: L1808065-01 Client ID: DUP Sample |               |                  |       |     |      |            |
| Solids, Total   | 85.7          | 87.4             | %     | 2   |      | 20         |

**Project Name:** WORC. SO**Lab Number:** L1807951**Project Number:** 2604**Report Date:** 03/15/18**Sample Receipt and Container Information**

Were project specific reporting limits specified?

YES

**Cooler Information**

|               |                     |
|---------------|---------------------|
| <b>Cooler</b> | <b>Custody Seal</b> |
| A             | Absent              |

**Container Information**

| <b>Container ID</b> | <b>Container Type</b>        | <b>Cooler</b> | <b>Initial pH</b> | <b>Final pH</b> | <b>Temp deg C</b> | <b>Pres</b> | <b>Seal</b> | <b>Frozen Date/Time</b> | <b>Analysis(*)</b> |
|---------------------|------------------------------|---------------|-------------------|-----------------|-------------------|-------------|-------------|-------------------------|--------------------|
| L1807951-01A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.2               | Y           | Absent      |                         | AS-TI(180)         |
| L1807951-01B        | Glass 250ml/8oz unpreserved  | A             | NA                |                 | 3.2               | Y           | Absent      |                         | TS(7)              |
| L1807951-02A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.2               | Y           | Absent      |                         | AS-TI(180)         |
| L1807951-02B        | Glass 250ml/8oz unpreserved  | A             | NA                |                 | 3.2               | Y           | Absent      |                         | TS(7)              |
| L1807951-03A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.2               | Y           | Absent      |                         | AS-TI(180)         |
| L1807951-03B        | Glass 250ml/8oz unpreserved  | A             | NA                |                 | 3.2               | Y           | Absent      |                         | TS(7)              |
| L1807951-04A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.2               | Y           | Absent      |                         | AS-TI(180)         |
| L1807951-04B        | Glass 250ml/8oz unpreserved  | A             | NA                |                 | 3.2               | Y           | Absent      |                         | TS(7)              |
| L1807951-05A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.2               | Y           | Absent      |                         | AS-TI(180)         |
| L1807951-05B        | Glass 250ml/8oz unpreserved  | A             | NA                |                 | 3.2               | Y           | Absent      |                         | TS(7)              |
| L1807951-06A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.2               | Y           | Absent      |                         | AS-TI(180)         |
| L1807951-06B        | Glass 250ml/8oz unpreserved  | A             | NA                |                 | 3.2               | Y           | Absent      |                         | TS(7)              |
| L1807951-07A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.2               | Y           | Absent      |                         | AS-TI(180)         |
| L1807951-07B        | Glass 250ml/8oz unpreserved  | A             | NA                |                 | 3.2               | Y           | Absent      |                         | TS(7)              |
| L1807951-08A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.2               | Y           | Absent      |                         | AS-TI(180)         |
| L1807951-08B        | Glass 250ml/8oz unpreserved  | A             | NA                |                 | 3.2               | Y           | Absent      |                         | TS(7)              |
| L1807951-09A        | Glass 60ml unpreserved split | A             | NA                |                 | 3.2               | Y           | Absent      |                         | AS-TI(180)         |
| L1807951-09B        | Glass 250ml/8oz unpreserved  | A             | NA                |                 | 3.2               | Y           | Absent      |                         | TS(7)              |

**Project Name:** WORC. SO  
**Project Number:** 2604

**Lab Number:** L1807951  
**Report Date:** 03/15/18

## GLOSSARY

### Acronyms

|          |   |
|----------|---|
| EDL      | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).                        |
| EPA      | - Environmental Protection Agency.  |
| LCS      | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.   |
| LCSD     | - Laboratory Control Sample Duplicate: Refer to LCS.  |
| LFB      | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.  |
| MDL      | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.   |
| MS       | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.  |
| MSD      | - Matrix Spike Sample Duplicate: Refer to MS.   |
| NA       | - Not Applicable.   |
| NC       | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.  |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine.   |
| NI       | - Not Ignitable.  |
| NP       | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.   |
| RL       | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.  |
| RPD      | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM      | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.  |
| STLP     | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.   |
| TIC      | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.   |

### Footnotes

- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

### Terms

**Analytical Method:** Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

**Final pH:** As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

**Frozen Date/Time:** With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

**Initial pH:** As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

**Total:** With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

### Data Qualifiers

- A** - Spectra identified as "Aldol Condensation Product".
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related

**Report Format:** Data Usability Report



**Project Name:** WORC. SO  
**Project Number:** 2604

**Lab Number:** L1807951  
**Report Date:** 03/15/18

#### Data Qualifiers

projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.
- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.
- J** - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
- ND** - Not detected at the reporting limit (RL) for the sample.

**Project Name:** WORC. SO  
**Project Number:** 2604

**Lab Number:** L1807951  
**Report Date:** 03/15/18

## REFERENCES

- 1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.
- 121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.





## Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

### Westborough Facility

**EPA 624:** m/p-xylene, o-xylene

**EPA 8260C:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.

**EPA 8270D:** NPW: Dimethylnaphthalene, 1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene, 1,4-Diphenylhydrazine.

**EPA 300:** DW: Bromide

**EPA 6860:** SCM: Perchlorate

**EPA 9010:** NPW and SCM: Amenable Cyanide Distillation

**SM4500:** NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO<sub>2</sub>, NO<sub>3</sub>.

### Mansfield Facility

**SM 2540D:** TSS

**EPA 8082A:** NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.

**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

**Biological Tissue Matrix:** EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

### Westborough Facility:

#### Drinking Water

**EPA 300.0:** Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE,**

**EPA 180.1, SM2130B, SM4500CI-D, SM2320B, SM2540C, SM4500H-B**

**EPA 332:** Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.

**Microbiology:** **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, SM9222D.**

#### Non-Potable Water

**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1:**

Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2:** Nitrate-N, **EPA 351.1, SM4500P-E, SM4500P-B, E,**

**SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**

**EPA 624:** Volatile Halocarbons & Aromatics,

**EPA 608:** Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs

**EPA 625:** SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045:** PCB-Oil.

**Microbiology:** **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, SM9222D.**

### Mansfield Facility:

#### Drinking Water

**EPA 200.7:** Al, Ba, Be, Cd, Cr, Cu, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1 Hg.**

**EPA 522.**

#### Non-Potable Water

**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.

**EPA 200.8:** Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn.

**EPA 245.1 Hg.**

**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.



## CHAIN OF CUSTODY

PAGE

OF

8 Walkup Drive  
Westboro, MA 01581  
Tel: 508-898-9220

320 Forbes Blvd  
Mansfield, MA 02048  
Tel: 508-822-9300

## Client Information

Client: LORD ASSA INC.  
Address: 1506 PROV. Sute 30  
NORWOOD, MA.  
Phone: 781-255-5554  
Email: R.TELLA@LORDASSA.COM

Additional Project Information:

## Project Information

Project Name: WORE SO  
Project Location: BORINGS  
Project #: 2604  
Project Manager: RALPH  
ALPHA Quote #:

## Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due:

Date Rec'd in Lab: 3/8/18

ALPHA Job #: L1807951

## Report Information - Data Deliverables

☒ ADEx ☐ EMAIL

## Billing Information

☐ Same as Client info PO #:

## Regulatory Requirements &amp; Project Information Requirements

☐ Yes ☒ No MA MCP Analytical Methods ☐ Yes ☒ No CT RCP Analytical Methods  
☐ Yes ☒ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)  
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)  
☐ Yes ☒ No NPDES RGP  
☐ Other State /Fed Program Criteria

| ANALYSIS   |   |   |  |   |  |   | SAMPLE INFO                        |                                |
|--|---|---|--|---|--|---|------------------------------------|--------------------------------|
| VOC: <input type="checkbox"/> 8260 <input type="checkbox"/> 624 <input type="checkbox"/> 524.2 | SVOC: <input type="checkbox"/> ABN <input type="checkbox"/> PAH | METALS: <input type="checkbox"/> MCP 13 <input type="checkbox"/> MCP 14 <input type="checkbox"/> RCP 15 | EPH: <input type="checkbox"/> RCRA5 <input type="checkbox"/> RCRA8 <input type="checkbox"/> PP13 | VPH: <input type="checkbox"/> Ranges & Targets <input type="checkbox"/> Ranges Only | <input type="checkbox"/> PCB <input type="checkbox"/> PEST | TPH: <input type="checkbox"/> Quant Only <input type="checkbox"/> Fingerprint | Filtration                         | <input type="checkbox"/> Field |
| TOTAL AL2 SE-NAC   |   |   |  |   |  |   | <input type="checkbox"/> Lab to do | Preservation                   |
|  |   |   |  |   |  |   | <input type="checkbox"/> Lab to do |                                |
|  |   |   |  |   |  |   | Sample Comments                    |                                |

ALPHA Lab ID  
(Lab Use Only)

(B-114) Sample ID

Collection

Date

Time

Sample Matrix

Sampler Initials

|          |                  |        |     |   |    |  |  |  |  |  |  |  |
|----------|------------------|--------|-----|---|----|--|--|--|--|--|--|--|
| 07951-01 | B-114, 4-6'      | 3/2/18 | N/A | S | ML |  |  |  |  |  |  |  |
| 02       | B-120A, 8-10'    |        |     |   |    |  |  |  |  |  |  |  |
| 03       | B-116, 19-21'    |        |     |   |    |  |  |  |  |  |  |  |
| 04       | B-12, 6-8'       |        |     |   |    |  |  |  |  |  |  |  |
| 05       | B-118B, 24-26'   |        |     |   |    |  |  |  |  |  |  |  |
| 06       | B-119A, 8-10'    |        |     |   |    |  |  |  |  |  |  |  |
| 07       | B-119A, 24-25.7' |        |     |   |    |  |  |  |  |  |  |  |
| 08       | B-117B, 8-10'    |        |     |   |    |  |  |  |  |  |  |  |
| 09       | B-117B, 19-21'   |        |     |   |    |  |  |  |  |  |  |  |

## Container Type

P= Plastic  
A= Amber glass  
V= Vial  
G= Glass  
B= Bacteria cup  
C= Cube  
O= Other  
E= Encore  
D= BOD Bottle

## Preservative

A= None  
B= HCl  
C= HNO<sub>3</sub>  
D= H<sub>2</sub>SO<sub>4</sub>  
E= NaOH  
F= MeOH  
G= NaHSO<sub>4</sub>  
H= Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>  
J= Ascorbic Acid  
K= NH<sub>4</sub>Cl  
L= Zn Acetate  
O= Other

Container Type G

Preservative A

Relinquished By:

R. Felle  
T. Muhl

Date/Time

3/5/18  
3/8/18 1730

Received By:

J. Muhl

Date/Time

3/8/18 1200  
3/8/18 1730

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO 01-01 (rev 12-Mar-2012)

# **APPENDIX G**

## **HYDRANT FLOW**

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# WATER SUPPLY GRAPH - N<sup>185</sup> HYDRAULIC GRAPH PAPER

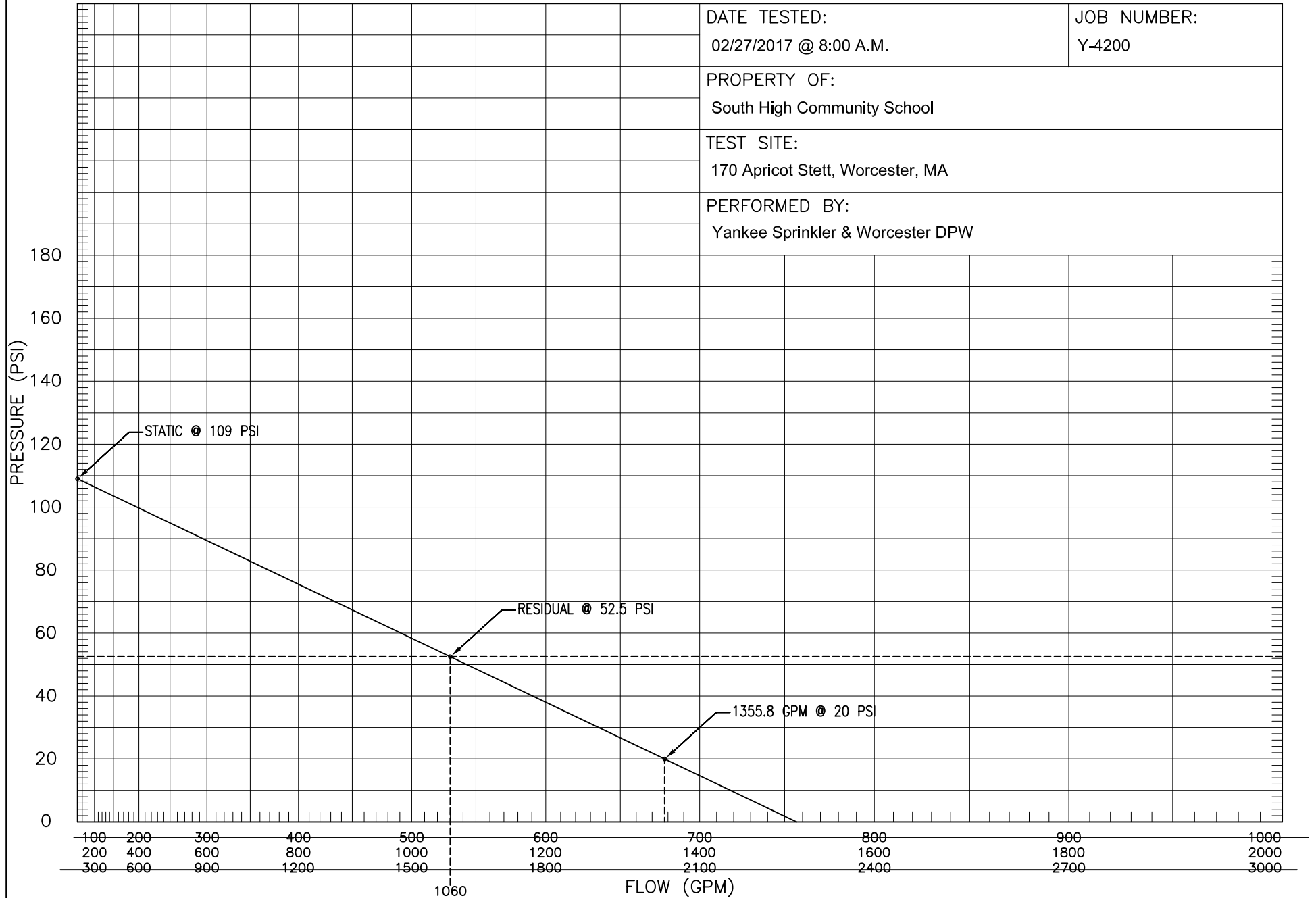
DATE TESTED:  
02/27/2017 @ 8:00 A.M.

JOB NUMBER:  
Y-4200

PROPERTY OF:  
South High Community School

TEST SITE:  
170 Apricot Stett, Worcester, MA

PERFORMED BY:  
Yankee Sprinkler & Worcester DPW



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**APPENDIX H**

**WPA FORM 4B**

**ORDER OF RESOURCE AREA DELINEATION**

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**Massachusetts Department of Environmental Protection**  
**Bureau of Resource Protection - Wetlands**  
**WPA Form 4B – Order of Resource Area**  
**Delineation**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

349-1171

MassDEP File Number

eDEP Transaction Number

Worcester

City/Town

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



**Note:**  
 Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

**A. General Information**

From: City of Worcester  
 1. Conservation Commission

2. This Issuance is for (check one):

- a. ☒ Order of Resource Area Delineation  
 b. ☐ Amended Order of Resource Area Delineation

3. Applicant:

a. First Name \_\_\_\_\_ b. Last Name \_\_\_\_\_  
City of Worcester – Department of Public Works & Parks  
 c. Organization \_\_\_\_\_  
20 E. Worcester Street  
 d. Mailing Address \_\_\_\_\_  
Worcester MA 01604  
 e. City/Town \_\_\_\_\_ f. State \_\_\_\_\_ g. Zip Code \_\_\_\_\_

4. Property Owner (if different from applicant):

a. First Name \_\_\_\_\_ b. Last Name \_\_\_\_\_  
City of Worcester - School Department  
 c. Organization \_\_\_\_\_  
20 Irving Street  
 d. Mailing Address \_\_\_\_\_  
Worcester MA 01609  
 e. City/Town \_\_\_\_\_ f. State \_\_\_\_\_ g. Zip Code \_\_\_\_\_

5. Project Location:

140 & 170 Apricot Street;  
Adjacent parts of 11 & 51 Goddard Memorial Dr.  
 a. Street Address \_\_\_\_\_ b. City/Town Worcester c. Zip Code \_\_\_\_\_  
140 & 170 Apricot Street: 56-016 -00013  
11 Goddard Memorial Dr.: 56-016 -00003  
51 Goddard Memorial Dr.: 56-016 -00011  
 d. Assessors Map/Plat Number \_\_\_\_\_ e. Parcel/Lot Number \_\_\_\_\_

Latitude and Longitude  
 (in degrees, minutes, seconds):  
 \_\_\_\_\_ d \_\_\_\_\_ m \_\_\_\_\_ s  
 f. Latitude \_\_\_\_\_ g. Longitude \_\_\_\_\_

6. Dates: 7/11/2017 7/31/2017 8/21/2017  
 a. Date ANRAD filed \_\_\_\_\_ b. Date Public Hearing Closed \_\_\_\_\_ c. Date of Issuance \_\_\_\_\_



**WPA Form 4B – Order of Resource Area  
Delineation**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

349-1171

MassDEP File Number

eDEP Transaction Number

Worcester

City/Town

**A. General Information (cont.)**

7. Title and Date (or Revised Date if applicable) of Final Plans and Other Documents:

ANRAD Application Materials

Received 7/11/2017

a. Title

b. Date

Existing Conditions Plan – Worcester South Community School

6/30/2017; last

c. Title

Revised 8/8/2017

d. Date

**B. Order of Delineation**

1. The Conservation Commission has determined the following (check whichever is applicable):

- a. ☐ **Accurate:** The boundaries described on the referenced plan(s) above and in the Abbreviated Notice of Resource Area Delineation are accurately drawn for the following resource area(s):

1. ☐ Bordering Vegetated Wetlands

2. ☐ Other resource area(s), specifically:

a.

- b. ☒ **Modified:** The boundaries described on the plan(s) referenced above, as modified by the Conservation Commission from the plans contained in the Abbreviated Notice of Resource Area Delineation, are accurately drawn for the following resource area(s):

1. ☒ **Bordering Vegetated Wetlands (BVW)**

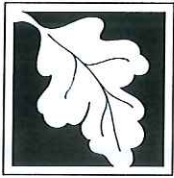
2. ☒ Other resource area(s), specifically: **Bank; and Riverfront Area**

a. **Modifications included:** Adding an additional BVW, with flag series CR (CR200-CR2010) which was field delineated during a site walk on 7/30/2017. See revised "Existing Conditions Plan – Worcester South Community School", prepared by Nitsch Engineering; last revised 8/8/2017. Note: Sheet EX-5 of the plan shows this modification - via the addition of such flagging (CR200-CR2010) which is located to the west of the existing dirt access road.

- c. ☐ **Inaccurate:** The boundaries described on the referenced plan(s) and in the Abbreviated Notice of Resource Area Delineation were found to be inaccurate and cannot be confirmed for the following resource area(s):

1. ☐ Bordering Vegetated Wetlands

2. ☐ Other resource area(s), specifically:



Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**WPA Form 4B – Order of Resource Area  
Delineation**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

349-1171

MassDEP File Number

eDEP Transaction Number

Worcester

City/Town

**B. Order of Delineation (cont.)**

3. ☐ The boundaries were determined to be inaccurate because:

---

---

---

**C. Findings**

This Order of Resource Area Delineation determines that the boundaries of those resource areas noted above, have been delineated and approved by the Commission and are binding as to all decisions rendered pursuant to the Massachusetts Wetlands Protection Act (M.G.L. c.131, § 40) and its regulations (310 CMR 10.00). This Order does not, however, determine the boundaries of any resource area or Buffer Zone to any resource area not specifically noted above, regardless of whether such boundaries are contained on the plans attached to this Order or to the Abbreviated Notice of Resource Area Delineation.

This Order must be signed by a majority of the Conservation Commission. The Order must be sent by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate DEP Regional Office (see <http://www.mass.gov/eea/agencies/massdep/about/contacts/find-the-massdep-regional-office-for-your-city-or-town.html>).

**D. Appeals**

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate DEP Regional Office to issue a Superseding Order of Resource Area Delineation. When requested to issue a Superseding Order of Resource Area Delineation, the Department's review is limited to the objections to the resource area delineation(s) stated in the appeal request. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order of Resource Area Delineation will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order or Determination, or providing written information to the Department prior to issuance of a Superseding Order or Determination.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act, (M.G.L. c. 131, § 40) and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal bylaw or ordinance, and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.



140+170 Apricot St.



Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands

Provided by MassDEP:

349-1171  
MassDEP File Number

**WPA Form 4B – Order of Resource Area  
Delineation**

eDEP Transaction Number

Worcester  
City/Town

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

8/22/17  
Date of Issuance

**E. Signatures**

5  
1. Number of Signers

Please indicate the number of members who will sign this form.

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Signature of Conservation Commission Member

**This Order is valid for three years from the date of issuance.**

If this Order constitutes an Amended Order of Resource Area Delineation, this Order does not extend the issuance date of the original Final Order, which expires on \_\_\_\_\_ unless extended in writing by the issuing authority.

This Order is issued to the applicant and the property owner (if different) as follows:

2. ☒ By hand delivery on

3. ☐ By certified mail, return receipt requested on

a. Date

a. Date



Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**Request for Departmental Action Fee  
Transmittal Form**

DEP File Number:

Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

**A. Request Information**

1. Location of Project

a. Street Address

b. City/Town, Zip

c. Check number

d. Fee amount

2. Person or party making request (if appropriate, name the citizen group's representative):

Name

Mailing Address

City/Town

State

Zip Code

Phone Number

Fax Number (if applicable)

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

Name

Mailing Address

City/Town

State

Zip Code

Phone Number

Fax Number (if applicable)

4. DEP File Number:

**Important:**  
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



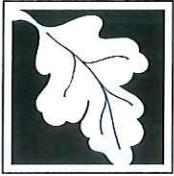
**B. Instructions**

1. When the Departmental action request is for (check one):

- ☐ Superseding Order of Conditions – Fee: \$120.00 (single family house projects) or \$245 (all other projects)
- ☐ Superseding Determination of Applicability – Fee: \$120
- ☐ Superseding Order of Resource Area Delineation – Fee: \$120

Send this form and check or money order, payable to the *Commonwealth of Massachusetts*, to:

Department of Environmental Protection  
Box 4062  
Boston, MA 02211



Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**Request for Departmental Action Fee  
Transmittal Form**

DEP File Number:

Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

**B. Instructions (cont.)**

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.
3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see <http://www.mass.gov/eea/agencies/massdep/about/contacts/>).
4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.



**Massachusetts Department of Environmental Protection**  
Bureau of Resource Protection - Wetlands

**WPA Form 4B – Order of Resource Area  
Delineation**

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

eDEP Transaction Number

City/Town

**Recording Information**

Prior to commencement of work, this Order of Resource Area Delineation must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Resource Area Delineation. The recording information on this page shall be submitted to the Conservation Commission listed below.

Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

Conservation Commission

Please be advised that the Order of Resource Area Delineation for the Project at:

Project Location

MassDEP File Number

Has been recorded at the Registry of Deeds of:

County

Book

Page

For:

Property Owner

and has been noted in the chain of title of the affected property in:

Book

Page

In accordance with the Order of Resource Area Delineation issued on:

Date

If recorded land, the instrument number identifying this transaction is:

Instrument Number

If registered land, the document number identifying this transaction is:

Document Number

Signature of Applicant

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# **APPENDIX I**

## **PHASE I ENVIRONMENTAL SITE ASSESSMENT**

**DO NOT REMOVE  
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# **Lord Associates, Inc.**

*Environmental Consulting & Licensed Site Professional Services*

1506 Providence Highway - Suite 30  
Norwood, MA 02062-4647

Voice: 781.255.5554  
Fax: 781.255.5535  
[www.lordenv.com](http://www.lordenv.com)

## **PHASE I-ENVIRONMENTAL SITE ASSESSMENT**

**School Property  
170 Apricot Street  
Worcester, Massachusetts**

*Prepared for:*

**Mr. Ammar Dieb  
Universal Environmental Consultants  
12 Brewster Road  
Framingham, MA 01702-6218**

*Prepared by:*

**Lord Associates, Inc.  
1506 Providence Highway, Suite 30  
Norwood, Massachusetts 02062**

**Project # 2467**

**November 16, 2016**

# Lord Associates, Inc.

Environmental Consulting & Licensed Site Professional Services

1506 Providence Highway - Suite 30  
Norwood, MA 02062-4647

Voice: 781.255.5554  
Fax: 781.255.5535  
www.lordenv.com

November 16, 2016

Mr. Ammar Dieb  
Universal Environmental Consultants  
12 Brewster Road  
Framingham, MA 01702-6218

**RE: Phase I Environmental Site Assessment  
170 Apricot Street  
Worcester, Massachusetts**

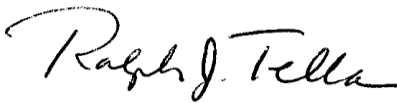
Dear Mr. Dieb:

Lord Associates, Inc. has completed a Phase I Environmental Site Assessment of the referenced property (the "Site"). Environmental investigations were completed with consideration to standard industry practice, the ASTM E-1527 site assessment standard entitled "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process". The purpose of this assessment was to identify "Recognized Environmental Conditions" as defined in ASTM E-1527-13, and to determine if additional investigation is warranted.

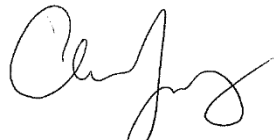
This assessment has not identified any Recognized Environmental Conditions (RECs) in connection with the property, 170 Apricot Street in Worcester, Massachusetts:

Please refer to the attached report for specific details and findings of our assessment. We appreciate the opportunity to have provided our professional environmental consulting and analytical services.

Sincerely,  
**LORD ASSOCIATES, INC.**



Ralph Tella, CHMM, LSP  
President  
Enc.: Phase I ESA



Andrea J. Lang  
Project Manager

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**APPENDIX C – SUPPLEMENTAL INFORMATION**

## **1.0 INTRODUCTION**

### **1.1 Purpose**

Lord Associates, Inc. (LAI) has completed a Phase I Environmental Site Assessment for 170 Apricot Street, Worcester, Massachusetts (the “Site”). The purpose of this assessment was to identify “Recognized Environmental Conditions” as defined in ASTM standard E-1527-13 (the Standard), and to determine if additional investigation is warranted.

Recognized Environmental Conditions are defined as the presence or likely presence of any hazardous substances or petroleum products on the property under conditions that indicate an existing release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property. The term Recognized Environmental Conditions is not intended to include *de minimis* conditions which generally do not present a material risk of harm to public health or the environment, and that generally would not be the subject of a notification and/or enforcement action if brought to the attention of appropriate governmental agencies.

The Phase I consisted of a Site reconnaissance and an assessment of the Site and surrounding properties for visual and/or olfactory evidence of the use, storage, and/or release of oil and/or hazardous material. The Phase I also included a review of federal, state, and local agency files regarding the history of the Site and surrounding area relative to the use, storage and/or release of oil and/or hazardous material.

Please note that an investigation for the presence of mold, asbestos and PCBs in building materials, lead-based paint, indoor air quality, or regulatory compliance is beyond the scope of work described by ASTM E 1527-13, therefore LAI did not explore those conditions.

### **1.2 Significant Assumptions**

Factual information regarding operations, conditions, and other data provided by the Client, site contacts, third parties, and governmental agencies are assumed to be correct and complete.

### **1.3 Special Terms and Conditions**

The Phase I ESA was conducted by LAI on behalf of the Client consistent with the agreed upon Scope of Work and LAI Standard Terms and Conditions. No other special terms and conditions were established in connection with these services.

## **2.0 SCOPE OF SERVICES**

This assessment was performed following standard industry practice and with consideration to the ASTM E-1527-13 site assessment standard entitled “Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process. The investigation included completion of the following tasks:

1. A field investigation was performed including a visual surficial inspection of the Site and abutting properties; and
2. The following agencies were contacted to inquire of past ownership, complaints, or violations concerning environmental issues at the Site and vicinity.
  - The Massachusetts Department of Environmental Protection (MADEP)
  - The Worcester Tax Assessor’s Office
  - The Worcester Town Clerk’s Office
  - The Worcester Board of Health
  - The Worcester Building Department
  - The Worcester Water Department
  - The Worcester Conservation Commission
  - The Worcester Fire Prevention Office
  - Environmental Data Resources
  - Sanborn Fire Insurance Maps

## **3.0 SITE DESCRIPTION**

### **3.1 Site Location and Parcel Legal Description**

Information provided indicates that the Site consists of one lot totaling approximately 42.6 acres of land located at the north side of Apricot Street in Worcester, Massachusetts. A Site Location Map is included as **Figure 1**. The Site is designated as Parcel ID 56-016-00013 with the Worcester Tax Assessor’s Department. The Tax Assessor’s Map is included as **Figure 2** and a Site Plan depicting pertinent Site features is included as **Figure 3**.

Information provided indicates the Site longitude and latitude are approximately - 71.863925° west and 42.244457° north, respectively. Universal Transverse Mercator (UTM) coordinates are approximately 4,680,676 meters north by 263,710 meters east.

### **3.2 Site and Vicinity General Characteristics**

According to municipal records, the Site is approximately 42.6 acres. The Site property is located in an area zoned as Residential Limited (RL-7). The Lot is occupied by two school buildings; Dr. Arthur Sullivan Middle School and South High Community School. South High Community School is the only building included in this assessment. The school building is a Worcester high school. The building has a footprint of approximately 244,486



square feet and is located on the southwest portion of the lot. Paved parking areas and driveways exist on the south, east and west sides of the Site building. Walkways and a small playground exist on the north side of the building.

A track exists to the north of the Site. Dr. Arthur Sullivan Middle School exists to the east of the Site and residential properties exist to the south and west.

### **3.3 Current Property Use**

The Site has been occupied by South High Community School since 1978.

### **3.4 Description of Improvements**

The Site is improved with one two- and three-story building constructed on-slab. The building consists of offices, classrooms, cafeterias, an auto shop and pool and has a footprint of approximately 244,486 square feet. The building is located on the southwest portion of the lot. Paved parking areas and driveways exist on the south, east and west sides of the Site building. Walkways and a small playground exist on the north side of the building. According to assessor's records, the building was constructed in 1990. However, based on information provided by Maureen Binienda, the School Superintendent, the building was constructed in 1978. A detailed Site description is presented in **Section 4.0**.

#### **3.4.1 Wastewater**

Wastewater generated on-Site is discharged to the municipal sewer. No information pertaining to storm water handling and/or management was encountered during this assessment. No floor drains, sumps, oil/water separators or storm drains were observed in the building.

#### **3.4.2 Water Supply**

Water is supplied by the Town of Worcester; the connection date was not available through files reviewed.

#### **3.4.3 Wells**

No potable, groundwater monitoring, irrigation, injection, dry, or abandoned wells were observed or identified from the interviews or records reviewed.

#### **3.4.4 Heating/Cooling System**

Heat and cooling for the building is provided by approximately 20 electric air handling units located on the perimeter of the building. Natural gas-fired roof top HVAC units provided additional heat and cooling for the building.

### **3.4.5 Solid Waste Disposal**

A solid waste compactor and recycling dumpster were observed on the south side of the building. There were no areas of solid waste disposal, mounds or depressions, or areas apparently filled or graded by non-natural causes suggesting solid waste disposal observed.

### **3.4.6 Storage Tanks**

One 275-gallon diesel AST was observed in the maintenance area and is associated with the emergency generator.

One 2,400-gallon diesel UST was removed on July 10, 2007, from the west side of the building. Details regarding the UST removal are presented in **Section 5.1.6**.

### **3.4.7 Transformers, Hydraulic Equipment and Other Potential Evidence of the Potential Use of Polychlorinated Biphenyls**

Polychlorinated Biphenyls (PCBs) can be found in hydraulic-oil filled electrical equipment (such as motors and pumps), capacitors or transformers, and fluorescent light ballasts manufactured prior to July 2, 1979.

One hydraulic elevator was observed in the building. The hydraulic reservoir for the elevator equipment was observed above the concrete floors; evidence of minor leaks and staining from the equipment was observed in the elevator equipment rooms. However, the equipment is located on a concrete floor; no cracks were observed in the floors.

One solid waste compactor was observed on the south side of the building. The hydraulic reservoir for the equipment was observed above the concrete pad; evidence of minor leaks and staining from the equipment was observed.

Two aboveground hydraulic automobile lifts were observed in the auto shop. Minor staining was observed on the concrete in the auto shop area. Based on operations in the auto shop classroom, minor staining associated with auto repairs is anticipated. Mr. Gregory Ricotti, the Head of the Auto Department reported that one underground hydraulic auto lift was removed from the auto shop in 1994. According to Mr. Ricotti, no leaking was observed from the hydraulic equipment at the time of the removal. No removal permits were available at the Fire or Building Departments.

No additional evidence of the potential use of polychlorinated biphenyls (PCBs) was observed on the Site during the inspections. Sampling of building materials for PCBs is beyond the scope of ASTM 1527-13.

### **3.5 Current Uses of Adjoining Properties**

A track exists to the north of the Site. Dr. Arthur Sullivan Middle School exists to the east of the Site and residential properties exist to the south and west. No bulk fuel storage was observed on adjacent properties. The table below summarizes current abutting land usage.

**Table 1**  
**Area Land Usage**

| <b>Usage</b>                      | <b>Orientation</b> |
|-----------------------------------|--------------------|
| Athletic track                    | North              |
| Single-family residential homes   | South              |
| Dr. Arthur Sullivan Middle School | East               |
| Single-family residential homes   | West               |

### **4.0 USER PROVIDED INFORMATION**

#### **4.1 User Questionnaire**

A summary of user provided information is provided below.

#### 4.1 User Questionnaire

|   |                                     |
|---|-------------------------------------|
| A User Questionnaire was provided to the user (Client) to assist the user and LAI in gathering information from the user that may be material to identifying RECs. The following answers were provided by the Client.   | <b>Response Inquiry</b>             |
| Name and title  | Jeffrey Martin, Facilities Director |
| Tenure with Site  | 3 years                             |
| Are you aware of any environmental cleanup liens against the property that are filed or recorded under federal, tribal, state or local law?   | NO                                  |
| Are you aware of any Activity and Use Limitations, such as engineering controls, land use restrictions or institutional controls that are in place at the site and/or have been filed or recorded in a registry under federal, tribal, state or local law?  | NO                                  |
| As the user of this ESA do you have any specialized knowledge or experience related to the property or nearby properties? For example, are you involved in the same line of business as the current or former occupants of the property or an adjoining property so that you would have specialized knowledge of the chemicals and processes used by this type of business? | NO                                  |
| Does the purchase price being paid for this property reasonably reflect the fair market value of the property? If you conclude that there is a difference, have you considered whether the lower purchase price is because contamination is known or believed to be present at the property?  | NA                                  |
| Are you aware of commonly known or reasonably ascertainable information about the property that would help the environmental professional to identify conditions indicative of releases or threatened releases? For example, as user:   | NO                                  |
| Do you know the past uses of the property?  | NO                                  |
| Do you know of specific chemicals that are present or once were present at the property?  | NO                                  |
| Do you know of spills or other chemical releases that have taken place at the property?   | NO                                  |
| Do you know of any environmental cleanups that have taken place at the property?  | NO                                  |
| As the user of this ESA, based on your knowledge and experience related to the property are there any obvious indicators that point to the presence or likely presence of contamination at the property?  | NO                                  |

#### 4.2 Title Records

LAI did not review the property title.

#### 4.3 Environmental Liens, Activity and Use Limitations

The owner has no knowledge of environmental liens, and the agency check revealed no listing for an Activity and Use Limitation in connection with the Site.

#### 4.4 Specialized Knowledge

No specialized knowledge of Recognized Environmental Conditions was provided to LAI by the owner or client.

#### **4.5 Commonly Known or Reasonably Ascertainable Information**

No commonly known or reasonably ascertainable information regarding Recognized Environmental Conditions was provided to LAI by the owner or client.

#### **4.6 Valuation Reduction for Environmental Issues**

No information regarding the sale price of the Site in comparison to the expected value of the property was provided to LAI by the owner or client.

#### **4.7 Owner, Property Manager, and Occupant Information**

According to the Worcester Assessor's Department, the current owner of the property is:

City of Worcester, School Department  
Worcester, Massachusetts 01609

LAI conducted an interview with Mr. Timothy Fournier, the Maintenance Supervisor for the South High Community School. Mr. Fournier provided information regarding the history of the Site and operations at the Site.

#### **4.8 Reason for Performing Phase I Study**

A Phase I ESA is being conducted in connection with the redevelopment of the property.

### **5.0 RECORDS REVIEWS**

A review of federal, state and local regulatory agency files was conducted in accordance with ASTM E-1527-13 standards to identify the use, generation, storage, treatment, disposal and/or release of oil and/or hazardous materials that may potentially impact the Site.

#### **5.1 Municipal Offices**

##### **5.1.1 Assessor's Office**

Lord Associates, Inc. visited the municipal Assessor's Office to review historical ownership information for the Site. This data was reviewed for the purposes of land use determination and should not be relied upon as a complete chain-of-title. The following table offers a summary of ownership information obtained at the assessor's office for the Site.

**Table 2**  
**Chain of Title**

| Grantee           | Date of Acquisition | Book/Page |
|-------------------|---------------------|-----------|
| Earl R. Perry     | Unknown             | Unknown   |
| City of Worcester | 2/11/1974           | 5436/61   |

#### 5.1.2 Board of Health

LAI made inquiries at the municipal Board of Health Department. No records of environmental concern were on-file for the Site.

#### 5.1.3 Building Department

A review of files was requested at the municipal Building Department to obtain information on historical building alterations. Building department records were available dating back to 2001, prior to 2001 records were archived. No records of environmental significance were on-file.

#### 5.1.4 Conservation Commission

A review of files was requested at the municipal Conservation Commission regarding environmental violations. No records were available pertaining to the Site.

#### 5.1.5 Clerk's Office

A review of files was requested at the municipal Clerk's Office regarding environmental violations. No records were available pertaining to the Site.

#### 5.1.6 Fire Department

LAI requested a review of information regarding the storage of hazardous materials at the Site from the municipal Fire Prevention Office. One 2,400-gallon diesel UST was removed on July 10, 2007, from the west side of the building. A UST Closure report prepared by Corporate Environmental Advisors, Inc. (CEA) dated November 28, 2007 was reviewed at the Fire Prevention Office. Two small holes were observed in the tank. However, laboratory results of the confirmatory soil samples indicated that no concentrations of EPH were detected exceeding regulatory standards.

### **5.2 Sanborn/Historical Map Review**

Sanborn Fire Insurance Maps were reviewed for the Site and vicinity. Sanborn Maps usually show property use and underground commercial fuel storage for the purposes of insurance companies. No Sanborn Maps were available for the Site and vicinity.

### 5.3 Historical Aerial Photograph Review

Aerial photographs from 1960, 1963, 1966, 1971, 1972, 1996, 1997, 2001, 2003, 2004, 2005, 2008, 2009, 2010, and 2012 were reviewed through the Historic Aerials website ([www.historicaerials.com](http://www.historicaerials.com)) and a current 2016 aerial photograph was reviewed from Google Earth. The following table summarizes the aerial photographs review.

**Table 3**  
**Aerial Photographs**

| Aerial Year   | Site Description   | Area Description |                   |
|---|--|------------------|-------------------|
|   |  | Direction        | Description       |
| 1960<br>1963<br>1966<br>1971,<br>1972                   | The Site appears as undeveloped land.                          | North            | Undeveloped land  |
|   |  | South            | Residential homes |
|   |  | East             | Undeveloped land  |
|   |  | West             | Residential homes |
| 1996<br>2001<br>2003<br>2004<br>2005<br>2009 to<br>2016 | The Site building appears similar to the current configuration | North            | Athletic Track    |
|   |  | South            | Residential homes |
|   |  | East             | School            |
|   |  | West             | Residential homes |

### 5.4 Radius Search for Properties of Environmental Concern

A radius search was conducted of federal and state-listed sites of potential environmental concern as outlined in ASTM E-1527 guidelines. The search was performed using software developed by Environmental Data Resources (EDR).

The Site is not listed on any of the regulatory databases. Sites identified within the designated ASTM search radii are summarized in the following table. The EDR report is included in **Appendix B**.

**Table 4**  
**Properties of Potential Environmental Concern**

| NPL<br>(1 mi.) | RCRIS<br>TSDF<br>(1 mi.) | CERCLIS<br>(0.5 mi.) | Landfill<br>(0.5 mi.)                      | STATE SITES<br>(0.5 mi.)   | LUST &<br>SPILLS<br>(0.25 mile) | ERNS<br>(Site/<br>Abutters | RCRIS<br>(Site/<br>Abutter | UST<br>(Site/<br>Abutter |
|----------------|--------------------------|----------------------|--|--|---------------------------------|----------------------------|----------------------------|--------------------------|
| NI             | NI                       | NI                   | Ralph Seaver<br>51 Redfield St<br>Inactive | Ekco-Glaco Inc.<br>110 Goddard<br>Memorial<br>N/0.373 mi<br>Elev Diff=+63<br>2-18580/RAO<br><br>Millbrook Facility<br>1475 Main St<br>SE/0.428 mi<br>Elev Diff= -140<br>2-10973/RAO<br><br>Green Valley Oil<br>Station<br>200 Main St<br>SW/0.438 mi<br>Elev Diff=-70<br>2-12496/RAO<br><br>1 additional sites | NI                              | NI                         | NI                         | NI                       |

**Notes:**

All addresses are located in Worcester, MA

N=north, S=south, W=west, E=east

NPL = National Priorities List

RCRIS = Resource Conservation and Recovery Information System

TSDF = Treatment Storage & Disposal Facilities

ERNS = Environmental Response Notification System

NI = None Identified

NFA – LSP Opinion of No Further Action

RAO = Closed in accordance with MADEP Regulations

TierII = Listed with MADEP due to oil or hazardous material in soil/groundwater (not closed)

DPS = Downgradient Property Status (contamination is from an upgradient source)

UST = Underground Storage Tank

F = Final

AUL = Activity and Use Limitation

DEPNFA= DEP No Further Action

PENNFA=Pending No Further Action

## 5.5 Massachusetts Department of Environmental Protection Review

Site-specific files were not reviewed at the Massachusetts Department of Environmental Protection (MADEP) since sites identified in the EDR report have been closed out by the MADEP, the identified properties are located far enough away or topographically and/or hydraulically downgradient from the Site. The identified properties, therefore, are not suspected to pose a material threat of harm to the Site.



## **5.6 Previous Reports**

A UST Closure report prepared by Corporate Environmental Advisors, Inc. (CEA) dated November 28, 2007 was reviewed at the Fire Prevention Office. The findings of this report are presented in section 5.1.6. No other previous reports were made available through sources cited in this assessment.

## **5.7 Physical Setting Sources**

LAI reviewed information provided by the United States Geological Survey (USGS) in connection with physiographic conditions, soil and bedrock types. LAI also reviewed the MADEP Priority Resource Map for the area, and located natural resources during the Site Reconnaissance. According to the USGS Worcester, Massachusetts Quadrangle Topographical Map, the elevation of the Site is approximately 780 feet above mean sea level. Topography of the Site vicinity is gently sloped. The direction of groundwater flow in the vicinity is estimated to the northeast.

Bear Swamp is located approximately 460 feet to the northeast of the Site. Review of the Flood Insurance Rate Map (25027C0801E), dated July 4, 2011, published by the Federal Emergency Management Agency (FEMA) indicated the Site is located in Zone X, areas outside the 500-year flood plain with less than 0.2% annual probability of flooding.

Review of the MADEP Priority Resource Map published by the MADEP, indicated the Site is not located in a potential aquifer area. Review of the National Wetlands Inventory from the U.S. Fish and Wildlife Service, indicated that wetlands are located on the northern portion of the Site and on the north adjacent properties.

The Soil Survey of Worcester County indicates that soil in the vicinity of the Site is classified as Chatfield-Hollis-Rock outcrop, and is described as a well-drained, fine sandy loam with three to 15 percent slopes.

## **5.8 Historical Use Information**

Research regarding historical land usage of the Site and surrounding properties was conducted using data obtained from historical maps, parties familiar with the Site, and municipal officials. Based on information gathered through the course of this assessment, the following history of the Site has been prepared:

- The Site was developed in 1978 as the South High Community School, a City of Worcester high school. Prior to development the Site was undeveloped land.

## **6.0 SITE RECONNAISSANCE**

### **6.1 Methodology and Limiting Conditions**

On November 4, 2016, LAI personnel conducted on-site inspections, which consisted of a visual examination of the Site and portions of adjacent properties and interviews with Site personnel. Areas were examined for surficial indications of releases of oil and/or hazardous materials (OHM).

Mr. Timothy Fournier, the Maintenance Supervisor for the South High Community School accompanied our personnel during the inspection. A Site Plan depicting significant features observed is included as **Figure 3** and photographs are included in **Appendix A** of this report.

### **6.2 Interior Inspection**

The Site building has been occupied by South High Community School since 1978. The building consists of offices, classrooms, cafeterias, an auto shop and pool and has a footprint of approximately 244,486 square feet. Heat and cooling for the building is provided by approximately 20 electric air handling units located perimeter of the building. Natural gas-fired roof top HVAC units provided additional heat and cooling for the building. One 275-gallon diesel AST was observed in the maintenance area and is associated with the emergency generator. One hydraulic elevator was observed in the building. The hydraulic reservoir for the elevator equipment was observed above the concrete floors; evidence of minor leaks and staining from the equipment was observed in the elevator equipment rooms. However, the equipment is located on a concrete floor; no cracks were observed in the floors.

Two aboveground hydraulic automobile lifts were observed in the auto shop. Minor staining was observed on the concrete in the auto shop area. Based on operations in the auto shop classroom, minor staining associated with auto repairs is anticipated. Mr. Gregory Ricotti, the Head of the Auto Department reported that one underground hydraulic auto lift was removed from the auto shop in 1994. According to Mr. Ricotti, no leaking was observed from the hydraulic equipment at the time of the removal. No removal permits were available at the Fire or Building Departments.

Two flammables cabinets (containing retail-sized containers of spray paint and motor oil), one 55-gallon drum of waste oil with secondary containment and two oxygen tanks were observed in the auto shop. Minor staining was observed on the concrete in the auto shop area. Based on operations in the auto shop classroom, minor staining associated with auto repairs is anticipated.

No evidence of a significant surface release of OHM was observed through the course of our inspection. No visible evidence of significant mold was observed.

### **6.3 Exterior Inspection**

The Site is improved with one two- and three-story building constructed on-slab. The Lot is occupied by two school buildings; Dr. Arthur Sullivan Middle School and South High Community School. South High Community School is the only building included in this assessment. The building has a footprint of approximately 244,486 square feet. The building is located on the southwest portion of the lot. Paved parking areas and driveways exist on the south, east and west sides of the Site building. Walkways and a small playground exist on the north side of the building. A solid waste compactor and recycling dumpster were observed on the south side of the building.

A track exists to the north of the Site. Dr. Arthur Sullivan Middle School exists to the east of the Site and residential properties exist to the south and west.

LAI did not observe any odors, pools of liquid, ponds, lagoons, stressed vegetation, suspicious containers or tanks, or solid waste during the reconnaissance.

### **7.0 INTERVIEWS**

LAI interviewed the current owner representative in connection with property conditions and the potential for Recognized Environmental Conditions.

Mr. Timothy Fournier, the Maintenance Supervisor for the South High Community School accompanied our personnel during the inspection. They were interviewed and questioned of any knowledge regarding environmental conditions or releases at the Site.

## **8.0 SUMMARY OF FINDINGS AND CONCLUSION**

### **8.1 Findings**

Lord Associates, Inc. has completed a Phase I Environmental Site Assessment of the Site. This assessment was performed with consideration to standard industry practice and the ASTM E-1527-13 site assessment standard entitled "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process". Our findings are presented below:

1. Information provided indicates that the Site consists of one lot totaling approximately 42.6 acres of land located at the north side of Apricot Street in Worcester, Massachusetts. The Site is designated as Parcel ID 56-016-00013 with the Worcester Tax Assessor's Department. The Site property is located in an area zoned as Residential Limited (RL-7). The building was constructed in 1978.
2. The Site is improved with one two- and three-story building constructed on-slab. The building consists of offices, classrooms, cafeterias, an auto shop and pool and has a

footprint of approximately 244,486 square feet. The building is located on the southwest portion of the lot. Paved parking areas and driveways exist on the south, east and west sides of the Site building. Walkways and a small playground exist on the north side of the building.

3. The Site was developed in 1978 as the South High Community School, a City of Worcester high school. Prior to development the Site was undeveloped land.
4. Lord Associates, Inc. conducted an inspection of the Site consisting of a visual examination of the Site, immediate surrounding features, and abutting properties. The Site is connected to the municipal sewer and water systems.
5. Heat and cooling for the building is provided by approximately 20 electric air handling units located perimeter of the building. Natural gas-fired roof top HVAC units provided additional heat and cooling for the building.
6. Municipal file reviews were performed. Fire department records indicate that one 2,400-gallon diesel UST was removed on July 10, 2007, from the west side of the building. A UST Closure report prepared by Corporate Environmental Advisors, Inc. (CEA) dated November 28, 2007 was reviewed at the Fire Prevention Office. Two small holes were observed in the tank. However, laboratory results of the confirmatory soil samples indicated that no concentrations of EPH were detected exceeding the Regulatory Standards.
7. One 275-gallon diesel AST was observed in the maintenance area and is associated with the emergency generator.
8. The Site is not listed on any of the regulatory databases. Several state-listed properties were identified in the radius search of waste sites in the vicinity. Based on the information in the database, the location, distance, regulatory status and/or cleanup activities, it is our opinion that the remaining properties listed do not represent a material threat of harm to the subject site.

## **8.2 Conclusions**

This assessment has not identified any Recognized Environmental Conditions (RECs) in connection with the property, 170 Apricot Street in Worcester, Massachusetts.

Any exceptions to, or deletions from, ASTM Practice E1527 are described in **Section 9** of this report.

## **9.0 RESTRICTIVE CONDITIONS**

### **9.1 Limitations & Deviations**

LAI recognizes the following limitations and/or deviations from the Standard with respect to this Phase I Environmental Site Assessment:

- LAI did not interview past owners of the Site;
- LAI did not interview owners of neighboring property;
- LAI did not review Title Records for the Site; and
- LAI did not conduct an evaluation of the purchase price of the Site compared to the fair market value.

### **9.2 Significance of Data Gaps**

As described above, the deviations from the Standard constitute data gaps. However, it is our opinion that these data gaps do not raise reasonable concerns that would affect the ability to identify conditions indicative of a release or threatened release or Recognized Environmental Conditions (RECs) based upon other information collected during the course of the Phase I Environmental Site Assessment.

- Although the past owner and owners of neighboring property were not interviewed, site and surrounding area history does not indicate prior use involving oil and/or hazardous materials.
- In Massachusetts, all environmental liens and Activity and Use Limitations are identified on the MADEP sites database, which has been searched.
- Based on Site History, there is no reasonable indication that property value has been affected due to environmental concerns.

## **10.0 LIMITATIONS**

No warranty, whether expressed or implied, is given with respect to this report or any opinions expressed herein. It is expressly understood that this report and the opinions expressed herein are based upon Site conditions, as they existed only at the time of assessment. Nothing in this report constitutes a legal opinion or legal service, and should not be relied upon as such.

The data reported and the findings, observations, and opinions expressed in the report are limited by the Scope of Work. The Scope of Work was performed based on budgetary, time, and other constraints imposed by the Client, and the agencies and persons reviewed.

In preparing this report, Lord Associates, Inc. has relied upon and presumed accurate certain information about the Site and adjacent properties provided by governmental agencies, the client and others identified in the report. Except as otherwise stated in the

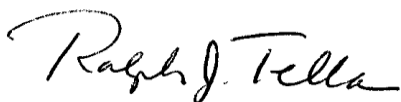
report, Lord Associates, Inc. has not attempted to verify the accuracy or completeness of any such information.

This report has been prepared on behalf of and for the exclusive use of the client, and those immediate entities involved with the proximate financing of this project, solely for use in the environmental evaluation of the Site. Any reuse or reliance on this report by any other third party shall be done only with the written consent of LAI.

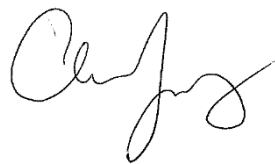
#### **11.0 SIGNATURES AND ENVIRONMENTAL PROFESSIONAL STATEMENT**

LAI declares that, to the best of our professional knowledge and belief, we meet the definition of *Environmental Professional* as defined in §312.10 of 40 CFR 312. LAI has the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. LAI has developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.

This report is dated this November 16, 2016 and is signed by individuals who are duly authorized to do so.



Ralph Tella, CHMM, LSP  
President



Andrea J. Lang  
Project Manager

# **APPENDIX J**

## **HAZARDOUS MATERIALS IDENTIFICATION SURVEY**

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**FINAL REPORT  
FOR  
HAZARDOUS MATERIALS IDENTIFICATION  
STUDY  
AT THE  
SOUTH HIGH COMMUNITY SCHOOL  
WORCESTER, MASSACHUSETTS**

PROJECT NO: 216 369.00

Survey Dates:  
November 2-8, 2016

CONDUCTED BY:  
**UNIVERSAL ENVIRONMENTAL CONSULTANTS  
12 Brewster Road  
Framingham, MA 01702**

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November 15, 2016

Mr. Eric Moore  
Lamoureux Pagano Associates  
108 Grove Street  
Worcester, MA 01605

Reference: Report for Hazardous Materials Identification Study  
South High Community School, Worcester, MA

Dear Mr. Moore:

Thank you for the opportunity for Universal Environmental Consultants (UEC) to provide professional services.

Enclosed please find the report for the hazardous materials identification study at the South High Community School, Worcester, MA.

Please do not hesitate to call should you have any questions.

Very truly yours,

Universal Environmental Consultants



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Ammar M. Dieb  
President

UEC:\216 369.00\Report.DOC

Enclosure

## 1.0 INTRODUCTION:

Universal Environmental Consultants (UEC) has been providing comprehensive asbestos services since 2001 and has completed projects throughout New England. We have completed projects for a variety of clients including commercial, industrial, municipal, and public and private schools. We maintain appropriate asbestos licenses and staff with a minimum of twenty five years of experience.

UEC was contracted by Lamoureux Pagano Associates to conduct the following services at the South High Community School, Worcester, Massachusetts:

- Asbestos Containing Materials (ACM) determination inspection and sampling;
- Polychlorinated Biphenyls (PCB's)-Electrical Equipment and Light Fixtures inspection;
- PCB's in Caulking inspection;
- Lead Based Paint (LBP) inspection;
- Mercury in Rubber Flooring inspection and sampling;
- Airborne Mold inspection and sampling;
- Radon sampling;
- Other hazardous materials inspection.

The scope of work included the inspection of accessible ACM, collection of bulk samples from materials suspected to contain asbestos, determination and quantities of types of ACM found and cost estimates for remediation. A comprehensive survey per the Environmental Protection Agency (EPA) NESHAP regulation would be required prior to any renovation or demolition activities.

Bulk samples analyses for asbestos were performed using the standard Polarized Light Microscopy (PLM) Method in accordance with EPA standard. Bulk samples were collected by Massachusetts licensed asbestos inspectors Mr. Leonard J. Busa (AI-030673) and Mr. Jason Becotte (AI-034963) and analyzed by a Massachusetts licensed laboratory SanAir Technologies Laboratory, Powhatan, VA.

Mercury samples were analyzed by an EPA licensed laboratory, EMSL, Cinnaminson, NJ in accordance with EPA method 7471B.

Airborne mold samples were analyzed by an EPA approved laboratory EMSL, Woburn, MA.

Radon samples were analyzed by an EPA licensed laboratory AccuStar, Medway, MA.

Samples results are attached.

## 2.0 FINDINGS:

### **Asbestos Containing Materials (ACM):**

The regulations for asbestos inspection are based on representative sampling. It would be impractical and costly to sample all materials in all areas. Therefore, representative samples of each homogenous area were collected and analyzed or assumed.

All suspect materials were grouped into homogenous areas. By definition a homogenous area is one in which the materials are evenly mixed and similar in appearance and texture throughout. A homogeneous area shall be determined to contain asbestos based on findings that the results of at least one sample collected from that area shows that asbestos is present in an amount greater than 1 percent in accordance with EPA regulations. Per the Department of Environmental Protection (DEP) any amount of asbestos found must be disposed as asbestos.

No additional suspect or accessible ACM were found during this survey. Hidden ACM may be found during the renovation and demolition activities.

**Number of Samples Collected:**

Exterior:

Ten (10) bulk samples were collected from materials suspected of containing asbestos, including:

**Type and Location of Suspect Material**

1. Exterior window framing caulking
2. Exterior window framing caulking
3. Exterior window glazing caulking
4. Exterior window glazing caulking
5. Exterior door framing caulking
6. Exterior door framing caulking
7. Exterior expansion joint caulking
8. Exterior expansion joint caulking
9. Exterior unit vent grille caulking
10. Exterior unit vent grille caulking

**Sample Results:****Type and Location of Suspect Material****Sample Result**

- |  |                      |
|--|----------------------|
| 1. Exterior window framing caulking    | No Asbestos Detected |
| 2. Exterior window framing caulking    | No Asbestos Detected |
| 3. Exterior window glazing caulking    | No Asbestos Detected |
| 4. Exterior window glazing caulking    | No Asbestos Detected |
| 5. Exterior door framing caulking      | No Asbestos Detected |
| 6. Exterior door framing caulking      | No Asbestos Detected |
| 7. Exterior expansion joint caulking   | No Asbestos Detected |
| 8. Exterior expansion joint caulking   | No Asbestos Detected |
| 9. Exterior unit vent grille caulking  | No Asbestos Detected |
| 10. Exterior unit vent grille caulking | No Asbestos Detected |

Interior:

Seventy two (72) bulk samples were collected from materials suspected of containing asbestos, including:

**Type and Location of Suspect Material**

1. Soft grey interior window glazing caulking at entrance to 101/105
2. Soft grey interior glazing caulking for small window in metal door at classroom 161
3. 2' x 2' Suspended acoustical ceiling tile at classroom 154
4. 2' x 2' Suspended acoustical ceiling tile at office
5. Mastic for wood block floor at classroom 157
6. Black sink damproofing at classroom 115
7. Black sink damproofing at classroom 111
8. Red duct sealant at maintenance
9. Generator exhaust insulation at maintenance
10. Generator exhaust insulation at maintenance
11. Vertical caulking in CMU wall where garage meet maintenance
12. Hard joint insulation above ceiling at janitor closet
13. 1' x 1' Acoustical ceiling tile at first floor main hallway
14. Joint compound at classroom 115
15. Finish on gypsum ceiling at electrical closet

16. Gypsum ceiling at electrical closet
17. Insulation inside wood fire door at entrance to 135
18. Mottled brown 12" x 12" vinyl floor tile at hallway by J-10
19. Mastic for mottled brown 12" x 12" vinyl floor tile at hallway by J-10
20. Dull lime 12" x 12" vinyl floor tile at classroom 154
21. Mastic for dull lime 12" x 12" vinyl floor tile at classroom 154
22. Dull lime 12" x 12" vinyl floor tile at classroom 122
23. Mastic for dull lime 12" x 12" vinyl floor tile at classroom 122
24. Brown/black 12" x 12" vinyl floor tile at classroom 121
25. Mastic for brown/black 12" x 12" vinyl floor tile at classroom 121
26. Dark blue 12" x 12" vinyl floor tile at hallway by classroom 158
27. Mastic for dark blue 12" x 12" vinyl floor tile at hallway by classroom 158
28. Mottled grey 12" x 12" vinyl floor tile at electrical closet
29. Mastic for mottled grey 12" x 12" vinyl floor tile at electrical closet
30. Soft grey glazing caulking for interior window at entrance to 300
31. Red/orange 12" x 12" vinyl floor tile at hallway by 313
32. Mastic for red/orange 12" x 12" vinyl floor tile at hallway by 313
33. Red/orange 12" x 12" vinyl floor tile at stairwell by 349
34. Mastic for red/orange 12" x 12" vinyl floor tile at stairwell by 349
35. Gold 12" x 12" vinyl floor tile at classroom 328
36. Mastic for gold 12" x 12" vinyl floor tile at classroom 328
37. 1' x 1' Acoustical ceiling tile at third floor main hallway
38. 2' x 2' Suspended acoustical ceiling tile at classroom 324
39. Red duct sealant above ceiling at main corridor
40. Red duct sealant above ceiling at office
41. Black coating on metal duct above ceiling at main corridor
42. Black coating on metal duct above ceiling at main corridor
43. Black coating on metal duct above ceiling at main corridor
44. Rough finish on gypsum wall
45. Joint compound on gypsum wall
46. Smooth ceiling plaster at room 117
47. Smooth ceiling plaster at J-10
48. Rough ceiling plaster at auditorium
49. Rough ceiling plaster at auditorium
50. Soft grey interior glazing caulking for small window in metal door at rear of auditorium
51. Finish on CMU wall at room 117
52. Joint compound at front of stage
53. Joint compound at guidance
54. 2' x 2' Suspended acoustical ceiling tile at classroom 242
55. 1' x 1' Acoustical ceiling tile at second floor main hallway
56. Residue glue daub on CMU wall for chalkboard at classroom 242
57. Brown mastic for cove base at hallway by locker room
58. Mottled grey 12" x 12" vinyl floor tile at cafeteria
59. Mastic for mottled grey 12" x 12" vinyl floor tile at cafeteria
60. Brown 12" x 12" vinyl floor tile at teacher's dining room
61. Mastic for brown 12" x 12" vinyl floor tile at teacher's dining room
62. Lime green 12" x 12" vinyl floor tile at hallway by 293
63. Mastic for lime green 12" x 12" vinyl floor tile at hallway by 293
64. Gold 12" x 12" vinyl floor tile at rear corridor hall to auditorium
65. Mastic for gold 12" x 12" vinyl floor tile at rear corridor hall to auditorium
66. Paint on beam at Pool building
67. Vertical caulking in CMU at Pool building
68. Hard joint insulation above ceiling at main corridor by 122
69. Red duct sealant above ceiling at main corridor by 122
70. Slight rough finish on gypsum ceiling underside of stairwell by E-12

71. Joint compound above ceiling tile at second floor main hallway
72. Residue fireproofing above ceiling tile at second floor main hallway

**Sample Results:**

| Type and Location of Suspect Material  | Sample Result        |
|--|----------------------|
| 1. Soft grey interior window glazing caulking at entrance to 101/105                   | 3% Asbestos          |
| 2. Soft grey interior glazing caulking for small window in metal door at classroom 161 | 3% Asbestos          |
| 3. 2' x 2' Suspended acoustical ceiling tile at classroom 154                          | No Asbestos Detected |
| 4. 2' x 2' Suspended acoustical ceiling tile at office                                 | No Asbestos Detected |
| 5. Mastic for wood block floor at classroom 157  | <1% Asbestos         |
| 6. Black sink damproofing at classroom 115   | <1% Asbestos         |
| 7. Black sink damproofing at classroom 111   | <1% Asbestos         |
| 8. Red duct sealant at maintenance   | No Asbestos Detected |
| 9. Generator exhaust insulation at maintenance   | No Asbestos Detected |
| 10. Generator exhaust insulation at maintenance  | No Asbestos Detected |
| 11. Vertical caulking in CMU wall where garage meet maintenance                        | No Asbestos Detected |
| 12. Hard joint insulation above ceiling at janitor closet                              | No Asbestos Detected |
| 13. 1' x 1' Acoustical ceiling tile at first floor main hallway                        | No Asbestos Detected |
| 14. Joint compound at classroom 115  | No Asbestos Detected |
| 15. Finish on gypsum ceiling at electrical closet                                      | No Asbestos Detected |
| 16. Gypsum ceiling at electrical closet  | No Asbestos Detected |
| 17. Insulation inside wood fire door at entrance to 135                                | 5% Asbestos          |
| 18. Mottled brown 12" x 12" vinyl floor tile at hallway by J-10                        | No Asbestos Detected |
| 19. Mastic for mottled brown 12" x 12" vinyl floor tile at hallway by J-10             | No Asbestos Detected |
| 20. Dull lime 12" x 12" vinyl floor tile at classroom 154                              | No Asbestos Detected |
| 21. Mastic for dull lime 12" x 12" vinyl floor tile at classroom 154                   | <1% Asbestos         |
| 22. Dull lime 12" x 12" vinyl floor tile at classroom 122                              | No Asbestos Detected |
| 23. Mastic for dull lime 12" x 12" vinyl floor tile at classroom 122                   | 3% Asbestos          |
| 24. Brown/black 12" x 12" vinyl floor tile at classroom 121                            | No Asbestos Detected |
| 25. Mastic for brown/black 12" x 12" vinyl floor tile at classroom 121                 | 4% Asbestos          |
| 26. Dark blue 12" x 12" vinyl floor tile at hallway by classroom 158                   | No Asbestos Detected |
| 27. Mastic for dark blue 12" x 12" vinyl floor tile at hallway by classroom 158        | 4% Asbestos          |
| 28. Mottled grey 12" x 12" vinyl floor tile at electrical closet                       | No Asbestos Detected |
| 29. Mastic for mottled grey 12" x 12" vinyl floor tile at electrical closet            | 4% Asbestos          |
| 30. Soft grey glazing caulking for interior window at entrance to 300                  | 2% Asbestos          |
| 31. Red/orange 12" x 12" vinyl floor tile at hallway by 313                            | No Asbestos Detected |
| 32. Mastic for red/orange 12" x 12" vinyl floor tile at hallway by 313                 | 2% Asbestos          |
| 33. Red/orange 12" x 12" vinyl floor tile at stairwell by 349                          | No Asbestos Detected |
| 34. Mastic for red/orange 12" x 12" vinyl floor tile at stairwell by 349               | 5% Asbestos          |
| 35. Gold 12" x 12" vinyl floor tile at classroom 328                                   | No Asbestos Detected |
| 36. Mastic for gold 12" x 12" vinyl floor tile at classroom 328                        | 3% Asbestos          |
| 37. 1' x 1' Acoustical ceiling tile at third floor main hallway                        | No Asbestos Detected |
| 38. 2' x 2' Suspended acoustical ceiling tile at classroom 324                         | No Asbestos Detected |
| 39. Red duct sealant above ceiling at main corridor                                    | 2% Asbestos          |
| 40. Red duct sealant above ceiling at office   | No Asbestos Detected |
| 41. Black coating on metal duct above ceiling at main corridor                         | No Asbestos Detected |
| 42. Black coating on metal duct above ceiling at main corridor                         | No Asbestos Detected |
| 43. Black coating on metal duct above ceiling at main corridor                         | No Asbestos Detected |
| 44. Rough finish on gypsum wall  | No Asbestos Detected |
| 45. Joint compound on gypsum wall  | No Asbestos Detected |
| 46. Smooth ceiling plaster at room 117   | No Asbestos Detected |
| 47. Smooth ceiling plaster at J-10   | No Asbestos Detected |
| 48. Rough ceiling plaster at auditorium  | No Asbestos Detected |

|  |                      |
|--|----------------------|
| 49. Rough ceiling plaster at auditorium  | No Asbestos Detected |
| 50. Soft grey interior glazing caulking for small window in metal door at rear of auditorium | 5% Asbestos          |
| 51. Finish on CMU wall at room 117   | No Asbestos Detected |
| 52. Joint compound at front of stage   | No Asbestos Detected |
| 53. Joint compound at guidance   | No Asbestos Detected |
| 54. 2' x 2' Suspended acoustical ceiling tile at classroom 242                               | No Asbestos Detected |
| 55. 1' x 1' Acoustical ceiling tile at second floor main hallway                             | No Asbestos Detected |
| 56. Residue glue daub on CMU wall for chalkboard at classroom 242                            | <1% Asbestos         |
| 57. Brown mastic for cove base at hallway by locker room                                     | No Asbestos Detected |
| 58. Mottled grey 12" x 12" vinyl floor tile at cafeteria                                     | No Asbestos Detected |
| 59. Mastic for mottled grey 12" x 12" vinyl floor tile at cafeteria                          | 2% Asbestos          |
| 60. Brown 12" x 12" vinyl floor tile at teacher's dining room                                | 2% Asbestos          |
| 61. Mastic for brown 12" x 12" vinyl floor tile at teacher's dining room                     | 2% Asbestos          |
| 62. Lime green 12" x 12" vinyl floor tile at hallway by 293                                  | No Asbestos Detected |
| 63. Mastic for lime green 12" x 12" vinyl floor tile at hallway by 293                       | 4% Asbestos          |
| 64. Gold 12" x 12" vinyl floor tile at rear corridor hall to auditorium                      | No Asbestos Detected |
| 65. Mastic for gold 12" x 12" vinyl floor tile at rear corridor hall to auditorium           | No Asbestos Detected |
| 66. Paint on beam at Pool building   | No Asbestos Detected |
| 67. Vertical caulking in CMU at Pool building  | No Asbestos Detected |
| 68. Hard joint insulation above ceiling at main corridor by 122                              | No Asbestos Detected |
| 69. Red duct sealant above ceiling at main corridor by 122                                   | 2% Asbestos          |
| 70. Slight rough finish on gypsum ceiling underside of stairwell by E-12                     | No Asbestos Detected |
| 71. Joint compound above ceiling tile at second floor main hallway                           | No Asbestos Detected |
| 72. Residue fireproofing above ceiling tile at second floor main hallway                     | No Asbestos Detected |

#### **Observations and Conclusions:**

The condition of ACM is very important. ACM in good condition does not present a health issue unless it is disturbed. Therefore, it is not necessary to remediate ACM in good condition unless it will be disturbed through renovation, demolition or other activity.

Refer to the AHERA Management Plan for condition of ACM.

1. Soft grey interior window glazing caulking was found to contain asbestos.
2. Soft grey interior glazing caulking for small window in metal door was found to contain asbestos.
3. Mastic for wood block floor was found to contain <1% asbestos. Per DEP regulations the waste must be treated as asbestos.
4. Black sink damproofing was found to contain <1% asbestos. Per DEP regulations the waste must be treated as asbestos.
5. Soft grey glazing caulking for interior window was found to contain asbestos.
6. Red duct sealant was found to contain asbestos.
7. Residue glue daub on CMU wall for chalkboard was found to contain <1% asbestos. Per DEP regulations the waste must be treated as asbestos.
8. Mastic for various types of vinyl floor tile was found to contain asbestos.
9. Fireproofing was assumed to contain asbestos. The ACM is too high to access.
10. Stage fire curtain was assumed to contain asbestos.
11. Transite tables were observed and were assumed to contain asbestos.
12. Glue holding old blackboard was assumed to contain asbestos.
13. Exterior damproofing on foundation/exterior walls was assumed to contain asbestos. The demolition contractor will have to segregate the ACM from non-ACM building surfaces for proper disposal. A non-traditional abatement plan would have to be prepared and submitted to the DEP for approval.
14. Roofing was removed 2004.
15. Underground sewer pipes were assumed to contain asbestos.
16. All other suspect materials were found not to contain asbestos. Hidden ACM may be found during renovation and demolition activities.



## **Polychlorinated Biphenyls (PCB's)-Electrical Equipment and Light Fixtures:**

### ***Observations and Conclusions***

Visual inspection of various equipments such as light fixtures, thermostats, exit signs and switches was performed for the presence of PCB's and mercury. Ballasts in light fixtures were assumed not to contain PCB's since there were labels indicating that "No PCB's" was found. Tubes in light fixtures, thermostats, signs and switches were assumed to contain mercury. It would be very costly to test those equipments and dismantling would be required to access. Therefore, the above equipments should be disposed in an EPA approved landfill as part of the demolition project.

## **PCB's in Caulking Material:**

### ***Observations and Conclusions***

Building caulking was assumed to contain PCB's. PCB's are manmade chemicals that were widely produced and distributed across the country from the 1950s to 1977 until the production of PCB's was banned by the US Environmental Protection Agency (EPA) law which became effective in 1978. PCB's are a class of chemicals made up of more than 200 different compounds. PCB's are non-flammable, stable, and good insulators so they were widely used in a variety of products including: electrical transformers and capacitors, cable and wire coverings, sealants and caulking, and household products such as television sets and fluorescent light fixtures. Because of their chemical properties, PCB's are not very soluble in water and they do not break down easily in the environment. PCB's also do not readily evaporate into air but tend to remain as solids or thick liquids. Even though PCB's have not been produced or used in the country for more than 30 years, they are still present in the environment in the air, soil, and water and in our food. EPA requires that all construction waste including caulking be disposed as PCB's if PCB's level exceed 50 mg/kg (ppm). An abatement plan might also be required.

## **Lead Based Paint (LBP):**

### ***Observations and Conclusions***

A school is not considered a regulated facility. All LBP activities performed, including waste disposal, should be in accordance with applicable Federal, State, or local laws, ordinances, codes or regulations governing evaluation and hazard reduction. These requirements can be found in OSHA 29 CFR 1926-Construction Industry Standards, 29 CFR 1926.62-Construction Industry Lead Standards, 29 CFR 1910.1200-Hazards Communication, 40 CFR 261-EPA Regulations. According to OSHA, any amount of LBP triggers compliance.

## **Mercury in Rubber Flooring:**

### ***Number of Samples Collected***

Four (4) bulk samples were collected from the following.

### **Type and Location of Material**

1. Rubber flooring at gymnasium
2. Rubber flooring at gymnasium
3. Rubber flooring at Room 292
4. Rubber flooring at Room 293

### ***Sample Results***

#### **Type and Location of Material**

#### **Sample Result**

- |                                 |           |
|---------------------------------|-----------|
| 1. Rubber flooring at gymnasium | 180 mg/kg |
| 2. Rubber flooring at gymnasium | 51 mg/kg  |
| 3. Rubber flooring at Room 292  | 120 mg/kg |
| 4. Rubber flooring at Room 293  | 82 mg/kg  |

### ***Observations and Conclusions:***

Samples results indicated the presence of high level of mercury. Mercury was assumed to have leached into the concrete slab. Sampling would be required to determine extent of contamination/leaching.

**Airborne Mold:**

Airborne mold testing was performed utilizing Zefon International Incorporated's Air-O-Cell® sampling device following all manufacturer supplied recommended sampling procedures. Air-O-Cell® is a direct read total particulate air sampling device. It works using the inertial impaction principle similar to other spore trap devices. It is designed for the rapid collection and analysis of airborne particulate including bioaerosols. The particulate includes fibers (e.g. asbestos, fiberglass, cellulose, clothing fibers) opaque particles (e.g. fly ash, combustion particles, copy toner, oil droplets, paint), and bioaerosols (e.g. mold spores, pollen, insect parts, skin cell fragments).<sup>1</sup>

The method involves drawing a known quantity of air through a sterile sampling cassette. Subsequent to sampling, the cassette is sealed and transferred to a microbiology laboratory under chain of custody protocol for microscopic analysis. This method counts both viable and nonviable mold spores.

The outside sample was collected by rear entrance to the school.

**AIRBORNE MOLD and PARTICULATE**

| Lab ID #       | Location          | Total Mold Counts/M <sup>3</sup> | Pollen | Insect Fragment | Hyphal Fragments |
|----------------|-------------------|----------------------------------|--------|-----------------|------------------|
| 131605426-0001 | Room 327          | 234                              | ND     | ND              | ND               |
| 131605426-0002 | Room 338          | 660                              | ND     | 40              | ND               |
| 131605426-0003 | Room 356          | 350                              | ND     | ND              | ND               |
| 131605426-0004 | Room 303          | 330                              | ND     | ND              | ND               |
| 131605426-0005 | Room 308          | 120                              | ND     | ND              | 40               |
| 131605426-0006 | Room 212 Guidance | 610                              | ND     | ND              | ND               |
| 131605426-0007 | Main Office       | 200                              | ND     | ND              | ND               |
| 131605426-0008 | Room 246          | 220                              | ND     | 7               | ND               |
| 131605426-0009 | Library           | 60                               | ND     | ND              | ND               |
| 131605426-0010 | Room 233          | 577                              | ND     | ND              | ND               |
| 131605426-0011 | Room 102          | 220                              | ND     | ND              | ND               |
| 131605426-0012 | Room 122          | 107                              | ND     | ND              | ND               |
| 131605426-0013 | Room 115          | 27                               | ND     | ND              | ND               |
| 131605426-0014 | Room 154          | 720                              | ND     | ND              | ND               |
| 131605426-0015 | Room 158          | 80                               | ND     | ND              | ND               |
| 131605426-0016 | Gymnasium         | 1,180                            | ND     | ND              | ND               |
| 131605426-0017 | Room 266 Music    | 187                              | ND     | ND              | ND               |
| 131605426-0018 | Auditorium        | 1,000                            | ND     | ND              | ND               |
| 131605426-0019 | Cafeteria         | 350                              | ND     | ND              | ND               |
| 131605426-0020 | Outside           | 14,370                           | ND     | ND              | ND               |

<sup>1</sup> Zefon International Inc. <[www.zefon.com](http://www.zefon.com)>

**AIRBORNE MOLD and PARTICULATE  
(Subjective Scales)**

| Lab ID #       | Location          | Skin Fragment Density (SFD) | Fibrous Particulates (FP) | Total Background Particulate (TBP) |
|----------------|-------------------|-----------------------------|---------------------------|------------------------------------|
| 131605426-0001 | Room 327          | 2                           | 1                         | 1                                  |
| 131605426-0002 | Room 338          | 2                           | 1                         | 1                                  |
| 131605426-0003 | Room 356          | 2                           | 1                         | 1                                  |
| 131605426-0004 | Room 303          | 2                           | 1                         | 1                                  |
| 131605426-0005 | Room 308          | 2                           | 1                         | 1                                  |
| 131605426-0006 | Room 212 Guidance | 2                           | 1                         | 1                                  |
| 131605426-0007 | Main Office       | 2                           | 1                         | 1                                  |
| 131605426-0008 | Room 246          | 2                           | 1                         | 2                                  |
| 131605426-0009 | Library           | 2                           | 1                         | 1                                  |
| 131605426-0010 | Room 233          | 2                           | 1                         | 2                                  |
| 131605426-0011 | Room 102          | 2                           | 1                         | 1                                  |
| 131605426-0012 | Room 122          | 2                           | 2                         | 1                                  |
| 131605426-0013 | Room 115          | 1                           | 1                         | 1                                  |
| 131605426-0014 | Room 154          | 2                           | 1                         | 1                                  |
| 131605426-0015 | Room 158          | 1                           | 1                         | 1                                  |
| 131605426-0016 | Gymnasium         | 2                           | 1                         | 2                                  |
| 131605426-0017 | Room 266 Music    | 2                           | 1                         | 3                                  |
| 131605426-0018 | Auditorium        | 1                           | 1                         | 1                                  |
| 131605426-0019 | Cafeteria         | 2                           | 1                         | 1                                  |
| 131605426-0020 | Outside           | 1                           | 1                         | 1                                  |

**Legend:**

ND - Not Detected

**Observations and Conclusions:**

There are currently no guidelines or standards promulgated by a government agency or widely recognized scientific organizations for the interpretation of airborne mold spore levels. The most commonly employed tool used to assess if mold growth is occurring and there is amplification in a structure is to evaluate the indoor levels and species as well as to compare levels and species of mold outdoors to indoors. Typically, if there were more molds indoors, and/or if species were present indoors which were not present outdoors, then growth and amplification is likely occurring and further evaluation and perhaps remediation is recommended.

Based on comparisons with historical data from projects of similar type, building utilization, geographic location and season, the indoor airborne levels are considered very low. Indoor mold spore counts in late fall are typically in the 2,500-5,000-spores/cubic meter range.

Breathing zone indoor and also outdoor samples indicated the presence of large quantities of several common types of mold which are not considered to be hazardous. Pollen, insect fragments and Hyphal fragments were either not present or low in the samples. Hyphal fragment is a non-reproductive part of the mold.

Total background particulate on all samples was assessed as “1-2” on a scale of 1-5 where 1 is low and 5 is high. Skin fragment density on all samples was assessed as “1-2” on a scale of 1-4 where 1 is low and 4 is high. The total background levels are measured to determine airborne dust not related to airborne mold. Skin fragments are measured to determine proper housing cleaning.

No visible mold growth was found during the survey.

## Radon:

### ***Number of Samples Collected***

Twenty (20) air samples were collected at the following locations:

### **Location of Material**

1. First floor Classroom 161
2. First floor Classroom 114
3. First floor Classroom 121
4. First floor Classroom 122
5. First floor Classroom outside 152 entrance
6. First floor Classroom 101
7. First floor Classroom 105
8. First floor Classroom 158
9. First floor Classroom 157
10. First floor Classroom 155
11. First floor Classroom 151 office
12. First floor Custodian closet J11
13. First floor Storage room G11
14. First floor Hallway by room 163
15. First floor Room 117 lounge
16. First floor Custodian closet J10
17. First floor Office by room 161
18. First floor E12
19. First floor Classroom 115
20. First floor Classroom 114

### **Location of Material**

### **Sample Result**

|   |            |
|---|------------|
| 1. First floor Classroom 161                  | 4.1 pCi/L  |
| 2. First floor Classroom 114                  | 0.6 pCi/L  |
| 3. First floor Classroom 121                  | 1.0 pCi/L  |
| 4. First floor Classroom 122                  | 0.9 pCi/L  |
| 5. First floor Classroom outside 152 entrance | 0.9 pCi/L  |
| 6. First floor Classroom 101                  | <0.4 pCi/L |
| 7. First floor Classroom 105                  | <0.4 pCi/L |
| 8. First floor Classroom 158                  | 1.1 pCi/L  |
| 9. First floor Classroom 157                  | 0.8 pCi/L  |
| 10. First floor Classroom 155                 | 0.8 pCi/L  |
| 11. First floor Classroom 151 office          | 6.5 pCi/L  |
| 12. First floor Custodian closet J11          | 0.5 pCi/L  |
| 13. First floor Storage room G11              | 0.5 pCi/L  |
| 14. First floor Hallway by room 163           | 0.9 pCi/L  |
| 15. First floor Room 117 lounge               | 0.4 pCi/L  |
| 16. First floor Custodian closet J10          | 1.1 pCi/L  |
| 17. First floor Office by room 161            | 1.2 pCi/L  |
| 18. First floor E12                           | 2.5 pCi/L  |

19. First floor Classroom 115  
20. First floor Classroom 114

0.6 pCi/L  
0.4 pCi/L

#### **Observations and Conclusions:**

The measured radon concentrations at most areas were found to be much lower than the EPA guideline of 4.0-pCi/L, with the exception of the samples collected at Classroom 161 (4.1 pCi/L) and Classroom 151 office (6.9 pCi/L) where radon concentrations were found to be higher than EPA limit. It is recommended that a ninety (90) day testing be performed or a radon mitigation system be installed at each corner of the school.

No further action is required at other areas.

### **3.0 COST ESTIMATES:**

The cost includes removal and disposal of all accessible ACM, other hazardous material and an allowance for removal of inaccessible or hidden ACM that may be found during renovation or demolition project

| Location  | Material                             | Approximate Quantity    | Cost Estimate (\$)     |
|---|--------------------------------------|-------------------------|------------------------|
| Throughout  | Various Types of Flooring and Mastic | 105,000 SF              | 367,500.00             |
|   | Interior Windows                     | 180 Total               | 36,000.00              |
|   | Interior Doors with Windows          | 150 Total               | 30,000.00              |
|   | Wood Fire Doors                      | 25 Total                | 5,000.00               |
|   | Blackboards/Tackboards               | 150 Total               | 30,000.00              |
|   | Sinks                                | 25 Total                | 5,000.00               |
|   | Miscellaneous Hazardous Materials    | Unknown                 | 75,000.00              |
|   | Hidden ACM                           | Unknown                 | 25,000.00              |
|   | Light Fixtures                       | Unknown                 | 50,000.00              |
| Stage   | Fire Curtain                         | 1 Total                 | 7,500.00               |
|   | Paper under Hardwood Floor           | 1,800 SF                | 18,000.00              |
| Classroom 157   | Paper/Mastic for Wood Block Floor    | 1,200 SF                | 12,000.00              |
| Science Room  | Lab Tables                           | 2 Total                 | 2,500.00               |
| Hallways  | Fireproofing                         | 10,000 SF               | 90,000.00              |
| Gymnasium   | Rubber Flooring/Cement               | 19,000 SF               | 190,000.00             |
| Rooms 292/293   | Rubber Flooring/Cement               | 1,200 SF                | 18,000.00              |
| Exterior  | Transite Sewer Pipes                 | Unknown <sup>1</sup>    | 75,000.00              |
|   | Damproofing/Flashing on Walls        | 3,500 Tons <sup>1</sup> | 490,000.00             |
| PCB's Remediation <sup>2</sup>  |                                      |                         | 70,000.00              |
| Estimated costs for PCB's Testing and Abatement Plans Services <sup>2</sup>   |                                      |                         | 25,000.00              |
| Estimated costs for NESHAP Inspection and Testing Services                    |                                      |                         | 17,500.00              |
| Estimated costs for Design, Construction Monitoring and Air Sampling Services |                                      |                         | 180,000.00             |
| <b>TOTAL:</b>   |                                      |                         | <b>\$ 1,820,000.00</b> |

<sup>1</sup>: Part of total demolition.

<sup>2</sup>: Should results exceed EPA limit.

#### 4.0 DESCRIPTION OF SURVEY METHODS AND LABORATORY ANALYSES:

**Asbestos:**

Asbestos samples were collected using a method that prevents fiber release. Homogeneous sample areas were determined by criteria outlined in EPA document 560/5-85-030a. Bulk material samples were analyzed using PLM and dispersion staining techniques with EPA method 600/M4-82-020.

**Mercury in Rubber Flooring:**

The bulk sample was analyzed in accordance with EPA method 7471B.

**Airborne Mold:**

The samples were analyzed by an EPA approved laboratory EMSL, Woburn, MA.

**Radon:**

Radon samples were analyzed by an EPA licensed laboratory AccuStar, Medway, MA.

Inspection by:



Jason Becotte  
Asbestos Inspector

Inspected By:



Leonard J. Busa  
Asbestos Inspector

## **5.0 LIMITATIONS AND CONDITIONS:**

This report has been completed based on visual and physical observations made and information available at the time of the site visits, as well as an interview with the Owner's representatives. This report is intended to be used as a summary of available information on existing conditions with conclusions based on a reasonable and knowledgeable review of evidence found in accordance with normally accepted industry standards, state and federal protocols, and within the scope and budget established by the client. Any additional data obtained by further review must be reviewed by UEC and the conclusions presented herein may be modified accordingly.

This report and attachments, prepared for the exclusive use of Owner for use in an environmental evaluation of the subject site, are an integral part of the inspections and opinions should not be formulated without reading the report in its entirety. No part of this report may be altered, used, copied or relied upon without prior written permission from UEC, except that this report may be conveyed in its entirety to parties associated with Owner for this subject study.



## Asbestos Identification Laboratory

165 New Boston St., Ste 227

Woburn, MA 01801

781-932-9600

Web: [www.asbestosidentificationlab.com](http://www.asbestosidentificationlab.com)

Email: [mikemanning@asbestosidentificationlab.com](mailto:mikemanning@asbestosidentificationlab.com)

Batch:

17442



Lab Code: 200919-0

November 08, 2016

Ammar Dieb  
Universal Environmental Consultants  
12 Brewster Road  
Framingham, MA 01702

**Project Number:**

**Project Name:** South High, Worcester, MA

**Date Sampled:** 2016-11-03

**Work Received:** 2016-11-04

**Work Analyzed:** 2016-11-08

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

Dear Ammar Dieb,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project .

The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Ammar Dieb for your business.

Michael Manning  
Owner/Director



November 08, 2016

Ammar Dieb  
Universal Environmental Consultants  
12 Brewster Road  
Framingham, MA 01702

**Project Number:**

**Project Name:** South High, Worcester, MA

**Date Sampled:** 2016-11-03

**Work Received:** 2016-11-04

**Work Analyzed:** 2016-11-08

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

| FieldID | Material              | Location        | Color | Non-Asbestos %  | Asbestos %    |
|---------|-----------------------|-----------------|-------|-----------------|---------------|
| LabID   |                       |                 |       |                 |               |
| 1       | Window Caulk          | Exterior Frame  | brown | Non-Fibrous 100 | None Detected |
| 192854  |                       |                 |       |                 |               |
| 2       | Window Caulk          | Exterior Frame  | brown | Non-Fibrous 100 | None Detected |
| 192855  |                       |                 |       |                 |               |
| 3       | Window Glass Glaze    | Exterior Window | black | Non-Fibrous 100 | None Detected |
| 192856  |                       |                 |       |                 |               |
| 4       | Window Glass Glaze    | Exterior Window | black | Non-Fibrous 100 | None Detected |
| 192857  |                       |                 |       |                 |               |
| 5       | Door Frame Caulk      | Exterior Door   | brown | Non-Fibrous 100 | None Detected |
| 192858  |                       |                 |       |                 |               |
| 6       | Door Frame Caulk      | Exterior Door   | brown | Non-Fibrous 100 | None Detected |
| 192859  |                       |                 |       |                 |               |
| 7       | Expansion Joint Caulk | Exterior Joints | multi | Non-Fibrous 100 | None Detected |
| 192860  |                       |                 |       |                 |               |
| 8       | Expansion Joint Caulk | Exterior Joints | multi | Non-Fibrous 100 | None Detected |
| 192861  |                       |                 |       |                 |               |
| 9       | Vent Caulk            | Exterior Vents  | brown | Non-Fibrous 100 | None Detected |
| 192862  |                       |                 |       |                 |               |
| 10      | Vent Caulk            | Exterior Vents  | brown | Non-Fibrous 100 | None Detected |
| 192863  |                       |                 |       |                 |               |

Tuesday 08  
Analyzed by:



End of Report

Batch: 17442

Page 1 of 1

PL 4  
48-hour T4T

Town/City: Worcester, MA Building Name South High

Reported By: Tasar Becotte Date: 11-3-16 Due Date: \_\_\_\_\_  
Received By: [Signature] Date: 11/4/16



Mike Manning  
Asbestos Identification Lab  
165 New Boston Street, Ste 227  
Woburn, MA 01801  
781-932-9600  
[www.AsbestosIdentificationLab.com](http://www.AsbestosIdentificationLab.com)

NVLAP<sup>®</sup>  
Lab Code: 200919-0

Dear Ammar Dieb,

Enclosed please find 116 samples tested for **PLM** from project: **South High Community School, Worcester, MA**. Asbestos Identification Laboratory subcontracted the samples to be analyzed by a NVLAP accredited laboratory.

Thank you

Michael Manning

Asbestos Identification Laboratory

November 10<sup>th</sup>, 2016

# SanAir Technologies Laboratory

## Analysis Report

prepared for

## Asbestos Identification Laboratory

Report Date: 11/10/2016  
Project Name: South High  
Community School Worcester MA  
SanAir ID#: 16040780



NVLAP LAB CODE 200870-0



Certification # 652931



License # LAB0166



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# SanAir Technologies Laboratory, Inc.

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**Asbestos Identification Laboratory**  
165U New Boston St  
Suite 227  
Woburn, MA 01801

November 10, 2016

SanAir ID # 16040780  
Project Name: South High Community School Worcester MA  
Project Number:

Dear Michael Manning,

We at SanAir would like to thank you for the work you recently submitted. The 72 sample(s) were received on Wednesday, November 09, 2016 via FedEx. The final report(s) is enclosed for the following sample(s): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Sandra Sobrino  
Asbestos & Materials Laboratory Manager  
SanAir Technologies Laboratory

Final Report Includes:

- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

sample conditions:

2 sample(s) in Discrepancy w/ COC condition    70 sample(s) in Good condition



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SanAir ID Number

**16040780**

FINAL REPORT

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**Address:** 165U New Boston St  
Suite 227  
Woburn, MA 01801

**Project Number:**  
**P.O. Number:**  
**Project Name:** South High Community School Worcester MA

**Collected Date:** 11/4/2016  
**Received Date:** 11/9/2016 10:55:00 AM  
**Report Date:** 11/10/2016 3:19:42 PM  
**Analyst:** Rutter, Amber  
Tallert, Jonathan  
Vaughan, Nathaniel

## Asbestos Bulk PLM EPA 600/R-93/116

| SanAir ID / Description  | Stereoscopic Appearance                 | Components    |               | Asbestos Fibers |
|--|---|---------------|---------------|-----------------|
|  |   | % Fibrous     | % Non-Fibrous |                 |
| 1 / 16040780-001<br>Interior Window Gl Entrance To<br>101/ 105 | Various<br>Non-Fibrous<br>Heterogeneous | 40% Cellulose | 57% Other     | 3% Chrysotile   |

| SanAir ID / Description  | Stereoscopic Appearance                 | Components    |               | Asbestos Fibers |
|--|---|---------------|---------------|-----------------|
|  |   | % Fibrous     | % Non-Fibrous |                 |
| 2 / 16040780-002<br>Gl For Small Window In Metal<br>Door Crm 161 | Various<br>Non-Fibrous<br>Heterogeneous | 40% Cellulose | 57% Other     | 3% Chrysotile   |


| SanAir ID / Description               | Stereoscopic Appearance           | Components                                  |               | Asbestos Fibers |
|---------------------------------------|-----------------------------------|---|---------------|-----------------|
|                                       |                                   | % Fibrous                                   | % Non-Fibrous |                 |
| 3 / 16040780-003<br>2x2 SAT-I Crm 154 | White<br>Fibrous<br>Heterogeneous | 45% Cellulose<br>35% Glass<br>10% Min. Wool | 10% Other     | None Detected   |


| SanAir ID / Description                             | Stereoscopic Appearance           | Components                                  |               | Asbestos Fibers |
|---|-----------------------------------|---|---------------|-----------------|
|   |                                   | % Fibrous                                   | % Non-Fibrous |                 |
| 4 / 16040780-004<br>SAT-I Office By Cust. Breakroom | White<br>Fibrous<br>Heterogeneous | 45% Cellulose<br>35% Glass<br>10% Min. Wool | 10% Other     | None Detected   |

| SanAir ID / Description                                    | Stereoscopic Appearance               | Components |               | Asbestos Fibers |
|--|---------------------------------------|------------|---------------|-----------------|
|  |                                       | % Fibrous  | % Non-Fibrous |                 |
| 5 / 16040780-005<br>Mastic For Wood Block Floor Crm<br>157 | Black<br>Non-Fibrous<br>Heterogeneous |            | 100% Other    | < 1% Chrysotile |

| SanAir ID / Description                 | Stereoscopic Appearance               | Components |               | Asbestos Fibers |
|---|---------------------------------------|------------|---------------|-----------------|
|   |                                       | % Fibrous  | % Non-Fibrous |                 |
| 6 / 16040780-006<br>DP For Sink Crm 115 | Black<br>Non-Fibrous<br>Heterogeneous |            | 100% Other    | < 1% Chrysotile |

## Certification

**Analyst:**   
**Analysis Date:** 11/10/2016

**Approved Signatory:**   
**Date:** 11/10/2016

Page 3 of 20



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SanAir ID Number

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**Analyst:** Rutter, Amber  
Tallert, Jonathan  
Vaughan, Nathaniel

## Asbestos Bulk PLM EPA 600/R-93/116

| SanAir ID / Description                 | Stereoscopic Appearance               | Components |               | Asbestos Fibers |
|---|---------------------------------------|------------|---------------|-----------------|
|   |                                       | % Fibrous  | % Non-Fibrous |                 |
| 7 / 16040780-007<br>DP For Sink Crm 111 | Black<br>Non-Fibrous<br>Heterogeneous |            | 100% Other    | < 1% Chrysotile |

| SanAir ID / Description                      | Stereoscopic Appearance               | Components |               | Asbestos Fibers |
|--|---------------------------------------|------------|---------------|-----------------|
|  |                                       | % Fibrous  | % Non-Fibrous |                 |
| 8 / 16040780-008<br>Duct Sealant Maintenance | Brown<br>Non-Fibrous<br>Heterogeneous |            | 100% Other    | None Detected   |


| SanAir ID / Description                                   | Stereoscopic Appearance               | Components    |               | Asbestos Fibers |
|---|---------------------------------------|---------------|---------------|-----------------|
|   |                                       | % Fibrous     | % Non-Fibrous |                 |
| 9 / 16040780-009<br>Generator Exhaust @ Muffler End Plate | White<br>Non-Fibrous<br>Heterogeneous | 10% Cellulose | 90% Other     | None Detected   |


| SanAir ID / Description                        | Stereoscopic Appearance               | Components    |               | Asbestos Fibers |
|--|---------------------------------------|---------------|---------------|-----------------|
|  |                                       | % Fibrous     | % Non-Fibrous |                 |
| 10 / 16040780-010<br>Generator Exhaust @ Horiz | White<br>Non-Fibrous<br>Heterogeneous | 10% Cellulose | 90% Other     | None Detected   |

| SanAir ID / Description   | Stereoscopic Appearance                | Components |               | Asbestos Fibers |
|---|--|------------|---------------|-----------------|
|   |  | % Fibrous  | % Non-Fibrous |                 |
| 11 / 16040780-011<br>Vertical Caulk In CMU Where Garage Meets Maintenance | Yellow<br>Non-Fibrous<br>Heterogeneous |            | 100% Other    | None Detected   |

| SanAir ID / Description  | Stereoscopic Appearance           | Components                                  |               | Asbestos Fibers |
|--|-----------------------------------|---|---------------|-----------------|
|  |                                   | % Fibrous                                   | % Non-Fibrous |                 |
| 12 / 16040780-012<br>Non-Susp. E Off FG AC @ Jan Closet - V-11 | White<br>Fibrous<br>Heterogeneous | 55% Cellulose<br>30% Glass<br>10% Min. Wool | 5% Other      | None Detected   |

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**Analysis Date:** 11/10/2016

**Approved Signatory:**   
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Tallert, Jonathan  
Vaughan, Nathaniel

## Asbestos Bulk PLM EPA 600/R-93/116

| SanAir ID / Description                                       | Stereoscopic Appearance           | Components                                  |               | Asbestos Fibers |
|---|-----------------------------------|---|---------------|-----------------|
|   |                                   | % Fibrous                                   | % Non-Fibrous |                 |
| 13 / 16040780-013<br>(1x1) AT-1 1st Fl Main Hall<br>Along 165 | White<br>Fibrous<br>Heterogeneous | 55% Cellulose<br>30% Glass<br>10% Min. Wool | 5% Other      | None Detected   |

| SanAir ID / Description                          | Stereoscopic Appearance               | Components |               | Asbestos Fibers |
|--|---------------------------------------|------------|---------------|-----------------|
|  |                                       | % Fibrous  | % Non-Fibrous |                 |
| 14 / 16040780-014<br>Joint Compound (JC) Crm 115 | White<br>Non-Fibrous<br>Heterogeneous |            | 100% Other    | None Detected   |


| SanAir ID / Description  | Stereoscopic Appearance               | Components    |               | Asbestos Fibers |
|--|---------------------------------------|---------------|---------------|-----------------|
|  |                                       | % Fibrous     | % Non-Fibrous |                 |
| 15 / 16040780-015<br>Finish On Gyp Cly (Elect.<br>Closet) E-10 | White<br>Non-Fibrous<br>Heterogeneous | 10% Cellulose | 90% Other     | None Detected   |

| SanAir ID / Description                               | Stereoscopic Appearance               | Components |               | Asbestos Fibers |
|---|---------------------------------------|------------|---------------|-----------------|
|   |                                       | % Fibrous  | % Non-Fibrous |                 |
| 16 / 16040780-016<br>Gyp Cly #15 (Elect. Closet) E-10 | White<br>Non-Fibrous<br>Heterogeneous |            | 100% Other    | None Detected   |

| SanAir ID / Description   | Stereoscopic Appearance               | Components |               | Asbestos Fibers |
|---|---------------------------------------|------------|---------------|-----------------|
|   |                                       | % Fibrous  | % Non-Fibrous |                 |
| 17 / 16040780-017<br>Wood Fire Door - II (W/ Steel<br>Fr. Window) Entrance To 135 | White<br>Non-Fibrous<br>Heterogeneous |            | 95% Other     | 5% Amosite      |

| SanAir ID / Description                     | Stereoscopic Appearance               | Components |               | Asbestos Fibers |
|---|---------------------------------------|------------|---------------|-----------------|
|   |                                       | % Fibrous  | % Non-Fibrous |                 |
| 18 / 16040780-018<br>VT-I (18") Hall C J-10 | Brown<br>Non-Fibrous<br>Heterogeneous |            | 100% Other    | None Detected   |

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**Approved Signatory:**   
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Vaughan, Nathaniel

## Asbestos Bulk PLM EPA 600/R-93/116

| SanAir ID / Description                     | Stereoscopic Appearance                | Components |               | Asbestos Fibers |
|---|--|------------|---------------|-----------------|
|   |  | % Fibrous  | % Non-Fibrous |                 |
| 19 / 16040780-019<br>Mastic #18 Hall C J-10 | Yellow<br>Non-Fibrous<br>Heterogeneous |            | 100% Other    | None Detected   |

| SanAir ID / Description                        | Stereoscopic Appearance               | Components |               | Asbestos Fibers |
|--|---------------------------------------|------------|---------------|-----------------|
|  |                                       | % Fibrous  | % Non-Fibrous |                 |
| 20 / 16040780-020<br>VT-II (Dull Lino) Crm 154 | White<br>Non-Fibrous<br>Heterogeneous |            | 100% Other    | None Detected   |


| SanAir ID / Description                 | Stereoscopic Appearance               | Components |               | Asbestos Fibers |
|---|---------------------------------------|------------|---------------|-----------------|
|   |                                       | % Fibrous  | % Non-Fibrous |                 |
| 21 / 16040780-021<br>Mastic #20 Crm 154 | Black<br>Non-Fibrous<br>Heterogeneous |            | 100% Other    | < 1% Chrysotile |

| SanAir ID / Description            | Stereoscopic Appearance               | Components |               | Asbestos Fibers |
|------------------------------------|---------------------------------------|------------|---------------|-----------------|
|                                    |                                       | % Fibrous  | % Non-Fibrous |                 |
| 22 / 16040780-022<br>VT-II Crm 122 | White<br>Non-Fibrous<br>Heterogeneous |            | 100% Other    | None Detected   |

| SanAir ID / Description                 | Stereoscopic Appearance               | Components |               | Asbestos Fibers |
|---|---------------------------------------|------------|---------------|-----------------|
|   |                                       | % Fibrous  | % Non-Fibrous |                 |
| 23 / 16040780-023<br>Mastic #22 Crm 122 | Black<br>Non-Fibrous<br>Heterogeneous |            | 97% Other     | 3% Chrysotile   |

| SanAir ID / Description                 | Stereoscopic Appearance               | Components |               | Asbestos Fibers |
|---|---------------------------------------|------------|---------------|-----------------|
|   |                                       | % Fibrous  | % Non-Fibrous |                 |
| 24 / 16040780-024<br>VT-III 12" Crm 121 | Brown<br>Non-Fibrous<br>Heterogeneous |            | 100% Other    | None Detected   |

### Certification

Analyst:   
Analysis Date: 11/10/2016

Approved Signatory:

Date: 11/10/2016



Page 6 of 20



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SanAir ID Number

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**Analyst:** Rutter, Amber  
Tallert, Jonathan  
Vaughan, Nathaniel

## Asbestos Bulk PLM EPA 600/R-93/116

| SanAir ID / Description                 | Stereoscopic Appearance               | % Fibrous | Components    |  | Asbestos Fibers |
|---|---------------------------------------|-----------|---------------|--|-----------------|
|   |                                       |           | % Non-Fibrous |  |                 |
| 25 / 16040780-025<br>Mastic #24 Crm 121 | Black<br>Non-Fibrous<br>Heterogeneous |           | 96% Other     |  | 4% Chrysotile   |

| SanAir ID / Description                    | Stereoscopic Appearance              | % Fibrous | Components    |  | Asbestos Fibers |
|--|--------------------------------------|-----------|---------------|--|-----------------|
|  |                                      |           | % Non-Fibrous |  |                 |
| 26 / 16040780-026<br>VT-IV 12" Hall By 158 | Blue<br>Non-Fibrous<br>Heterogeneous |           | 100% Other    |  | None Detected   |


| SanAir ID / Description                     | Stereoscopic Appearance               | % Fibrous | Components    |  | Asbestos Fibers |
|---|---------------------------------------|-----------|---------------|--|-----------------|
|   |                                       |           | % Non-Fibrous |  |                 |
| 27 / 16040780-027<br>Mastic #26 Hall By 158 | Black<br>Non-Fibrous<br>Heterogeneous |           | 96% Other     |  | 4% Chrysotile   |


| SanAir ID / Description                            | Stereoscopic Appearance              | % Fibrous | Components    |  | Asbestos Fibers |
|--|--------------------------------------|-----------|---------------|--|-----------------|
|  |                                      |           | % Non-Fibrous |  |                 |
| 28 / 16040780-028<br>VT-V (12") Elect. Closet E-10 | Grey<br>Non-Fibrous<br>Heterogeneous |           | 100% Other    |  | None Detected   |

| SanAir ID / Description                            | Stereoscopic Appearance               | % Fibrous | Components    |  | Asbestos Fibers |
|--|---------------------------------------|-----------|---------------|--|-----------------|
|  |                                       |           | % Non-Fibrous |  |                 |
| 29 / 16040780-029<br>Mastic #28 Elect. Closet E-10 | Black<br>Non-Fibrous<br>Heterogeneous |           | 96% Other     |  | 4% Chrysotile   |

| SanAir ID / Description                                  | Stereoscopic Appearance              | % Fibrous | Components    |  | Asbestos Fibers |
|--|--------------------------------------|-----------|---------------|--|-----------------|
|  |                                      |           | % Non-Fibrous |  |                 |
| 30 / 16040780-030<br>Win Gl For Int. Win Entrance To 310 | Grey<br>Non-Fibrous<br>Heterogeneous |           | 98% Other     |  | 2% Chrysotile   |

### Certification

**Analyst:**   
**Analysis Date:** 11/10/2016

**Approved Signatory:**   
**Date:** 11/10/2016



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## Asbestos Bulk PLM EPA 600/R-93/116

| SanAir ID / Description                 | Stereoscopic Appearance                | % Fibrous | Components    |  | Asbestos Fibers |
|---|--|-----------|---------------|--|-----------------|
|   |  |           | % Non-Fibrous |  |                 |
| 31 / 16040780-031<br>VT-VII Hall By 313 | Orange<br>Non-Fibrous<br>Heterogeneous |           | 100% Other    |  | None Detected   |

| SanAir ID / Description                     | Stereoscopic Appearance               | % Fibrous | Components    |  | Asbestos Fibers |
|---|---------------------------------------|-----------|---------------|--|-----------------|
|   |                                       |           | % Non-Fibrous |  |                 |
| 32 / 16040780-032<br>Mastic #31 Hall By 313 | Black<br>Non-Fibrous<br>Heterogeneous |           | 98% Other     |  | 2% Chrysotile   |

| SanAir ID / Description                | Stereoscopic Appearance           | % Fibrous | Components    |  | Asbestos Fibers |
|--|-----------------------------------|-----------|---------------|--|-----------------|
|  |                                   |           | % Non-Fibrous |  |                 |
| 33 / 16040780-033<br>VT VII S.W By 349 | Red<br>Non-Fibrous<br>Homogeneous |           | 100% Other    |  | None Detected   |


| SanAir ID / Description                    | Stereoscopic Appearance             | % Fibrous | Components    |  | Asbestos Fibers |
|--|-------------------------------------|-----------|---------------|--|-----------------|
|  |                                     |           | % Non-Fibrous |  |                 |
| 34 / 16040780-034<br>Mastic #33 S.W By 349 | Black<br>Non-Fibrous<br>Homogeneous |           | 95% Other     |  | 5% Chrysotile   |

| SanAir ID / Description            | Stereoscopic Appearance              | % Fibrous | Components    |  | Asbestos Fibers |
|------------------------------------|--------------------------------------|-----------|---------------|--|-----------------|
|                                    |                                      |           | % Non-Fibrous |  |                 |
| 35 / 16040780-035<br>VT-IX Crm 328 | Yellow<br>Non-Fibrous<br>Homogeneous |           | 100% Other    |  | None Detected   |

| SanAir ID / Description                 | Stereoscopic Appearance             | % Fibrous | Components    |  | Asbestos Fibers |
|---|-------------------------------------|-----------|---------------|--|-----------------|
|   |                                     |           | % Non-Fibrous |  |                 |
| 36 / 16040780-036<br>Mastic #35 Crm 328 | Black<br>Non-Fibrous<br>Homogeneous |           | 97% Other     |  | 3% Chrysotile   |

### Certification

**Analyst:** Nathaniel Vaughan  
**Analysis Date:** 11/10/2016

**Approved Signatory:**   
**Date:** 11/10/2016



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## Asbestos Bulk PLM EPA 600/R-93/116

| SanAir ID / Description                    | Stereoscopic Appearance         | Components                     |               | Asbestos Fibers |
|--|---------------------------------|--------------------------------|---------------|-----------------|
|  |                                 | % Fibrous                      | % Non-Fibrous |                 |
| 37 / 16040780-037<br>AT-I 3rd Fl Main Hall | White<br>Fibrous<br>Homogeneous | 30% Cellulose<br>50% Min. Wool | 20% Other     | None Detected   |

| SanAir ID / Description            | Stereoscopic Appearance         | Components                     |               | Asbestos Fibers |
|------------------------------------|---------------------------------|--------------------------------|---------------|-----------------|
|                                    |                                 | % Fibrous                      | % Non-Fibrous |                 |
| 38 / 16040780-038<br>SAT-I Cxm 324 | White<br>Fibrous<br>Homogeneous | 40% Cellulose<br>40% Min. Wool | 20% Other     | None Detected   |


| SanAir ID / Description                         | Stereoscopic Appearance           | Components |               | Asbestos Fibers |
|---|-----------------------------------|------------|---------------|-----------------|
|   |                                   | % Fibrous  | % Non-Fibrous |                 |
| 39 / 16040780-039<br>Duct Sealant AC, MC By 351 | Red<br>Non-Fibrous<br>Homogeneous |            | 98% Other     | 2% Chrysotile   |


| SanAir ID / Description  | Stereoscopic Appearance           | Components |               | Asbestos Fibers |
|--|-----------------------------------|------------|---------------|-----------------|
|  |                                   | % Fibrous  | % Non-Fibrous |                 |
| 40 / 16040780-040<br>Duct Sealant AC, Office By<br>Cust. Breakroom | Red<br>Non-Fibrous<br>Homogeneous |            | 100% Other    | None Detected   |

| SanAir ID / Description                                     | Stereoscopic Appearance             | Components |               | Asbestos Fibers |
|---|-------------------------------------|------------|---------------|-----------------|
|   |                                     | % Fibrous  | % Non-Fibrous |                 |
| 41 / 16040780-041<br>Coating On Metal Duct AC, MC By<br>328 | Black<br>Non-Fibrous<br>Homogeneous |            | 100% Other    | None Detected   |

| SanAir ID / Description                                      | Stereoscopic Appearance             | Components |               | Asbestos Fibers |
|--|-------------------------------------|------------|---------------|-----------------|
|  |                                     | % Fibrous  | % Non-Fibrous |                 |
| 42 / 16040780-042<br>Coating On Metal Duct AC, MC By<br>J-31 | Black<br>Non-Fibrous<br>Homogeneous |            | 100% Other    | None Detected   |

### Certification

**Analyst:**   
**Analysis Date:** 11/10/2016

**Approved Signatory:**   
**Date:** 11/10/2016



# SanAir Technologies Laboratory, Inc.

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SanAir ID Number

**16040780**

FINAL REPORT

**Name:** Asbestos Identification Laboratory  
**Address:** 165U New Boston St  
Suite 227  
Woburn, MA 01801

**Project Number:**  
**P.O. Number:**  
**Project Name:** South High Community School Worcester MA

**Collected Date:** 11/4/2016  
**Received Date:** 11/9/2016 10:55:00 AM  
**Report Date:** 11/10/2016 3:19:42 PM  
**Analyst:** Rutter, Amber  
Tallert, Jonathan  
Vaughan, Nathaniel

## Asbestos Bulk PLM EPA 600/R-93/116

| SanAir ID / Description                                  | Stereoscopic Appearance             | % Fibrous | Components    |  | Asbestos Fibers |
|--|-------------------------------------|-----------|---------------|--|-----------------|
|  |                                     |           | % Non-Fibrous |  |                 |
| 43 / 16040780-043<br>Coating On Metal Duct AC, MC By 351 | Black<br>Non-Fibrous<br>Homogeneous |           | 100% Other    |  | None Detected   |

| SanAir ID / Description  | Stereoscopic Appearance             | % Fibrous | Components    |  | Asbestos Fibers |
|--|-------------------------------------|-----------|---------------|--|-----------------|
|  |                                     |           | % Non-Fibrous |  |                 |
| 44 / 16040780-044<br>Finish On Gyp Wall @ Bottom<br>Edge Of Wall Underside Of Stairs | White<br>Non-Fibrous<br>Homogeneous |           | 100% Other    |  | None Detected   |

| SanAir ID / Description   | Stereoscopic Appearance            | % Fibrous | Components    |  | Asbestos Fibers |
|---|------------------------------------|-----------|---------------|--|-----------------|
|   |                                    |           | % Non-Fibrous |  |                 |
| 45 / 16040780-045<br>#44 Up To 2nd Fl By Cust<br>Breakrm, Plaster | Grey<br>Non-Fibrous<br>Homogeneous |           | 100% Other    |  | None Detected   |


| SanAir ID / Description                          | Stereoscopic Appearance                 | % Fibrous | Components    |  | Asbestos Fibers |
|--|---|-----------|---------------|--|-----------------|
|  |   |           | % Non-Fibrous |  |                 |
| 46 / 16040780-046<br>Ceiling Plaster (CP) Rm 117 | Off-White<br>Non-Fibrous<br>Homogeneous |           | 100% Other    |  | None Detected   |

| SanAir ID / Description      | Stereoscopic Appearance                 | % Fibrous | Components    |  | Asbestos Fibers |
|------------------------------|---|-----------|---------------|--|-----------------|
|                              |   |           | % Non-Fibrous |  |                 |
| 47 / 16040780-047<br>CP J-10 | Off-White<br>Non-Fibrous<br>Homogeneous |           | 100% Other    |  | None Detected   |

| SanAir ID / Description                | Stereoscopic Appearance             | % Fibrous | Components    |  | Asbestos Fibers |
|--|-------------------------------------|-----------|---------------|--|-----------------|
|  |                                     |           | % Non-Fibrous |  |                 |
| 48 / 16040780-048<br>CP AOD, From Rear | White<br>Non-Fibrous<br>Homogeneous |           | 100% Other    |  | None Detected   |

### Certification

**Analyst:** Nathaniel Vaughan  
**Analysis Date:** 11/10/2016

**Approved Signatory:**   
**Date:** 11/10/2016



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SanAir ID Number

**16040780**

FINAL REPORT

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**Address:** 165U New Boston St  
Suite 227  
Woburn, MA 01801

**Project Number:**  
**P.O. Number:**  
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**Analyst:** Rutter, Amber  
Tallert, Jonathan  
Vaughan, Nathaniel

## Asbestos Bulk PLM EPA 600/R-93/116

| SanAir ID / Description                | Stereoscopic Appearance             | % Fibrous | Components    |  | Asbestos Fibers |
|--|-------------------------------------|-----------|---------------|--|-----------------|
|  |                                     |           | % Non-Fibrous |  |                 |
| 49 / 16040780-049<br>CP AOD, From Rear | White<br>Non-Fibrous<br>Homogeneous |           | 100% Other    |  | None Detected   |

| SanAir ID / Description   | Stereoscopic Appearance            | % Fibrous | Components    |  | Asbestos Fibers |
|---|------------------------------------|-----------|---------------|--|-----------------|
|   |                                    |           | % Non-Fibrous |  |                 |
| 50 / 16040780-050<br>G1 For Small Win. In Metal<br>Door, Rear Of AUD. Entrance Door | Grey<br>Non-Fibrous<br>Homogeneous |           | 95% Other     |  | 5% Chrysotile   |

| SanAir ID / Description                                   | Stereoscopic Appearance             | % Fibrous | Components    |  | Asbestos Fibers |
|---|-------------------------------------|-----------|---------------|--|-----------------|
|   |                                     |           | % Non-Fibrous |  |                 |
| 51 / 16040780-051<br>Painted Finish On CMU Wall Rm<br>117 | White<br>Non-Fibrous<br>Homogeneous |           | 100% Other    |  | None Detected   |


| SanAir ID / Description                       | Stereoscopic Appearance             | % Fibrous | Components    |  | Asbestos Fibers |
|---|-------------------------------------|-----------|---------------|--|-----------------|
|   |                                     |           | % Non-Fibrous |  |                 |
| 52 / 16040780-052<br>JC Front Of Stage (Aud.) | White<br>Non-Fibrous<br>Homogeneous |           | 100% Other    |  | None Detected   |

| SanAir ID / Description                  | Stereoscopic Appearance             | % Fibrous | Components    |  | Asbestos Fibers |
|--|-------------------------------------|-----------|---------------|--|-----------------|
|  |                                     |           | % Non-Fibrous |  |                 |
| 53 / 16040780-053<br>Guidance, Skim Coat | White<br>Non-Fibrous<br>Homogeneous |           | 100% Other    |  | None Detected   |

| SanAir ID / Description            | Stereoscopic Appearance         | % Fibrous                      | Components    |  | Asbestos Fibers |
|------------------------------------|---------------------------------|--------------------------------|---------------|--|-----------------|
|                                    |                                 |                                | % Non-Fibrous |  |                 |
| 54 / 16040780-054<br>SAT-I Crm 242 | White<br>Fibrous<br>Homogeneous | 40% Cellulose<br>40% Min. Wool | 20% Other     |  | None Detected   |

### Certification

**Analyst:** Nathaniel Vaughan  
**Analysis Date:** 11/10/2016

**Approved Signatory:**   
**Date:** 11/10/2016



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SanAir ID Number

**16040780**

FINAL REPORT

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**Address:** 165U New Boston St  
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Woburn, MA 01801

**Project Number:**  
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**Analyst:** Rutter, Amber  
Tallert, Jonathan  
Vaughan, Nathaniel

## Asbestos Bulk PLM EPA 600/R-93/116

| SanAir ID / Description                    | Stereoscopic Appearance         | Components                     |               | Asbestos Fibers |
|--|---------------------------------|--------------------------------|---------------|-----------------|
|  |                                 | % Fibrous                      | % Non-Fibrous |                 |
| 55 / 16040780-055<br>AT-I 2nd Fl Main Hall | White<br>Fibrous<br>Homogeneous | 40% Cellulose<br>40% Min. Wool | 20% Other     | None Detected   |

| SanAir ID / Description  | Stereoscopic Appearance             | Components |               | Asbestos Fibers |
|--|-------------------------------------|------------|---------------|-----------------|
|  |                                     | % Fibrous  | % Non-Fibrous |                 |
| 56 / 16040780-056<br>Residue Glue Daub On CMU Wall,<br>Assumed For Pre-Exist | Brown<br>Non-Fibrous<br>Homogeneous |            | 100% Other    | < 1% Chrysotile |


| SanAir ID / Description   | Stereoscopic Appearance             | Components |               | Asbestos Fibers |
|---|-------------------------------------|------------|---------------|-----------------|
|   |                                     | % Fibrous  | % Non-Fibrous |                 |
| 57 / 16040780-057<br>Mastic For Cove Base Hall Along<br>Boy's Lockers | Brown<br>Non-Fibrous<br>Homogeneous |            | 100% Other    | None Detected   |

| SanAir ID / Description        | Stereoscopic Appearance                 | Components |               | Asbestos Fibers |
|--------------------------------|---|------------|---------------|-----------------|
|                                |   | % Fibrous  | % Non-Fibrous |                 |
| 58 / 16040780-058<br>VT-V Cafe | Off-White<br>Non-Fibrous<br>Homogeneous |            | 100% Other    | None Detected   |

| SanAir ID / Description              | Stereoscopic Appearance             | Components |               | Asbestos Fibers |
|--------------------------------------|-------------------------------------|------------|---------------|-----------------|
|                                      |                                     | % Fibrous  | % Non-Fibrous |                 |
| 59 / 16040780-059<br>Mastic #58 Cafe | Black<br>Non-Fibrous<br>Homogeneous |            | 98% Other     | 2% Chrysotile   |

| SanAir ID / Description                             | Stereoscopic Appearance           | Components |               | Asbestos Fibers |
|---|-----------------------------------|------------|---------------|-----------------|
|   |                                   | % Fibrous  | % Non-Fibrous |                 |
| 60 / 16040780-060<br>VT-XI Teachers Dining (Rm 383) | Tan<br>Non-Fibrous<br>Homogeneous |            | 98% Other     | 2% Chrysotile   |

## Certification

**Analyst:**   
**Analysis Date:** 11/10/2016

**Approved Signatory:**   
**Date:** 11/10/2016



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SanAir ID Number

**16040780**

FINAL REPORT

**Name:** Asbestos Identification Laboratory  
**Address:** 165U New Boston St  
Suite 227  
Woburn, MA 01801

**Project Number:**  
**P.O. Number:**  
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**Analyst:** Rutter, Amber  
Tallert, Jonathan  
Vaughan, Nathaniel

## Asbestos Bulk PLM EPA 600/R-93/116

| SanAir ID / Description                | Stereoscopic Appearance             | % Fibrous | Components    | Asbestos Fibers |
|--|-------------------------------------|-----------|---------------|-----------------|
|  |                                     |           | % Non-Fibrous |                 |
| 61 / 16040780-061<br>Mastic #60 Rm 283 | Black<br>Non-Fibrous<br>Homogeneous |           | 98% Other     | 2% Chrysotile   |

| SanAir ID / Description               | Stereoscopic Appearance               | % Fibrous | Components    | Asbestos Fibers |
|---------------------------------------|---------------------------------------|-----------|---------------|-----------------|
|                                       |                                       |           | % Non-Fibrous |                 |
| 62 / 16040780-062<br>VT-X Hall By 293 | Green<br>Non-Fibrous<br>Heterogeneous |           | 100% Other    | None Detected   |

| SanAir ID / Description                     | Stereoscopic Appearance               | % Fibrous | Components    | Asbestos Fibers |
|---|---------------------------------------|-----------|---------------|-----------------|
|   |                                       |           | % Non-Fibrous |                 |
| 63 / 16040780-063<br>Mastic #62 Hall By 293 | Black<br>Non-Fibrous<br>Heterogeneous |           | 96% Other     | 4% Chrysotile   |

| SanAir ID / Description                               | Stereoscopic Appearance                | % Fibrous | Components    | Asbestos Fibers |
|---|--|-----------|---------------|-----------------|
|   |  |           | % Non-Fibrous |                 |
| 64 / 16040780-064<br>VT-IX Rear Corridor Hall To Aud. | Yellow<br>Non-Fibrous<br>Heterogeneous |           | 100% Other    | None Detected   |

| SanAir ID / Description                                    | Stereoscopic Appearance               | % Fibrous | Components    | Asbestos Fibers |
|--|---------------------------------------|-----------|---------------|-----------------|
|  |                                       |           | % Non-Fibrous |                 |
| 65 / 16040780-065<br>Mastic #64 Rear Corridor Hall To Aud. | Black<br>Non-Fibrous<br>Heterogeneous |           | 100% Other    | None Detected   |

| SanAir ID / Description                      | Stereoscopic Appearance               | % Fibrous | Components    | Asbestos Fibers |
|--|---------------------------------------|-----------|---------------|-----------------|
|  |                                       |           | % Non-Fibrous |                 |
| 66 / 16040780-066<br>Paint On Beam Pool Bldg | White<br>Non-Fibrous<br>Heterogeneous |           | 100% Other    | None Detected   |

## Certification

**Analyst:** Nathaniel Vaughan  
**Analysis Date:** 11/10/2016

**Approved Signatory:** [Signature]  
**Date:** 11/10/2016





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SanAir ID Number

**16040780**

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Woburn, MA 01801

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**Analyst:** Rutter, Amber  
Tallert, Jonathan  
Vaughan, Nathaniel

## Asbestos Bulk PLM EPA 600/R-93/116

| SanAir ID / Description                           | Stereoscopic Appearance              | % Fibrous | Components    |  | Asbestos Fibers |
|---|--------------------------------------|-----------|---------------|--|-----------------|
|   |                                      |           | % Non-Fibrous |  |                 |
| 67 / 16040780-067<br>Vert. Caulk In CMU Pool Bldg | Grey<br>Non-Fibrous<br>Heterogeneous |           | 100% Other    |  | None Detected   |

| SanAir ID / Description                 | Stereoscopic Appearance              | % Fibrous                 | Components    |  | Asbestos Fibers |
|---|--------------------------------------|---------------------------|---------------|--|-----------------|
|   |                                      |                           | % Non-Fibrous |  |                 |
| 68 / 16040780-068<br>E Off PG AC By 122 | Grey<br>Non-Fibrous<br>Heterogeneous | 5% Glass<br>10% Min. Wool | 85% Other     |  | None Detected   |


| SanAir ID / Description                     | Stereoscopic Appearance           | % Fibrous | Components    |  | Asbestos Fibers |
|---|-----------------------------------|-----------|---------------|--|-----------------|
|   |                                   |           | % Non-Fibrous |  |                 |
| 69 / 16040780-069<br>Duct Sealant AC By 122 | Red<br>Non-Fibrous<br>Homogeneous |           | 98% Other     |  | 2% Chrysotile   |


| SanAir ID / Description  | Stereoscopic Appearance             | % Fibrous                    | Components    |  | Asbestos Fibers |
|--|-------------------------------------|------------------------------|---------------|--|-----------------|
|  |                                     |                              | % Non-Fibrous |  |                 |
| 70 / 16040780-070<br>Finish On Gyp Clg, Underside Of<br>SW By E-12 | White<br>Non-Fibrous<br>Homogeneous | < 1% Cellulose<br>< 1% Glass | 100% Other    |  | None Detected   |

| SanAir ID / Description                                   | Stereoscopic Appearance             | % Fibrous | Components    |  | Asbestos Fibers |
|---|-------------------------------------|-----------|---------------|--|-----------------|
|   |                                     |           | % Non-Fibrous |  |                 |
| 71 / 16040780-071<br>JC Main Hall @ 2nd Fl, Above<br>AT-1 | White<br>Non-Fibrous<br>Homogeneous |           | 100% Other    |  | None Detected   |

| SanAir ID / Description   | Stereoscopic Appearance                 | % Fibrous                | Components    |  | Asbestos Fibers |
|---|---|--------------------------|---------------|--|-----------------|
|   |   |                          | % Non-Fibrous |  |                 |
| 72 / 16040780-072<br>Residue Fireproofing Main Hall<br>@ 2nd Fl, Above AT-1 | Various<br>Non-Fibrous<br>Heterogeneous | 3% Cellulose<br>3% Glass | 94% Other     |  | None Detected   |

### Certification

**Analyst:**   
**Analysis Date:** 11/10/2016

**Approved Signatory:**   
**Date:** 11/10/2016

### **Disclaimer**

The final report cannot be reproduced, except in full, without written authorization from SanAir. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample and information provided by the client. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government.

For NY state samples, method EPA 600/M4-82-020 is performed.

Polarized- light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

NY ELAP lab ID 11983



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**Asbestos  
Chain of Custody**

SanAir ID Number

160 90780

Asbestos Identification Laboratory  
165 New Boston Street, Suite 227  
Woburn, MA 01801

Project #:

Project Name: *South High Community School*

Date Collected: *11/4/16*

P.O. Number:

Collected by:

Phone #:

Fax #:

Email:

**Bulk**

|       |                          |                                     |
|-------|--------------------------|-------------------------------------|
| ABB   | PLM EPA 600/R-93/116     | <input checked="" type="checkbox"/> |
|       | Positive Stop            | <input type="checkbox"/>            |
| ABEPA | PLM EPA 400 Point Count  | <input type="checkbox"/>            |
| ABB1K | PLM EPA 1000 Point Count | <input type="checkbox"/>            |
| ABBEN | PLM EPA NOB              | <input type="checkbox"/>            |
| ABBCH | TEM Chatfield            | <input type="checkbox"/>            |
| ABBTM | TEM EPA NOB              | <input type="checkbox"/>            |

**Air**

|       |                |                          |
|-------|----------------|--------------------------|
| ABA   | PCM NIOSH 7400 | <input type="checkbox"/> |
| ABA-2 | OSHA w/ TWA*   | <input type="checkbox"/> |
| ABTEM | TEM AHERA      | <input type="checkbox"/> |
| ABATN | TEM NIOSH 7402 | <input type="checkbox"/> |
| ABT2  | TEM Level II   | <input type="checkbox"/> |

**Soil/Vermiculite**

|       |                              |                          |
|-------|------------------------------|--------------------------|
| ABSE  | PLM EPA 600/R-93/116 (Qual.) | <input type="checkbox"/> |
| ABSP  | PLM CARB 435 (LOD <1%)       | <input type="checkbox"/> |
| ABSP1 | PLM CARB 435 (LOD 0.25%)     | <input type="checkbox"/> |
| ABSP2 | PLM CARB 435 (LOD 0.1%)      | <input type="checkbox"/> |

**Dust**

|       |                          |                          |
|-------|--------------------------|--------------------------|
| ABWA  | TEM Wipe ASTM D-6480     | <input type="checkbox"/> |
| ABDMV | TEM Microvac ASTM D-5755 | <input type="checkbox"/> |

**Water**

|      |           |                          |
|------|-----------|--------------------------|
| ABHE | EPA 100.2 | <input type="checkbox"/> |
|------|-----------|--------------------------|

**New York ELAP**

|        |                       |                          |
|--------|-----------------------|--------------------------|
| PLM NY | PLM EPA 600/M4-82-020 | <input type="checkbox"/> |
| ABEPA2 | NY ELAP 198.1         | <input type="checkbox"/> |
| ABENY  | NY ELAP 198.6 PLM NOB | <input type="checkbox"/> |
| ABBNY  | NY ELAP 198.4 TEM NOB | <input type="checkbox"/> |

Matrix

Other

|                   |  |   |                                 |   |
|-------------------|--|---|---------------------------------|---|
| Turn Around Times | 3 HR (4 HR TEM) <input type="checkbox"/> | 6 HR (8HR TEM) <input type="checkbox"/> | 12 HR <input type="checkbox"/>  | 24 HR <input checked="" type="checkbox"/> |
|                   | 2 Days <input type="checkbox"/>          | 3 Days <input type="checkbox"/>         | 4 Days <input type="checkbox"/> | 5 Days <input type="checkbox"/>           |

**Special Instructions**

| Sample #   | Sample Identification/Location | Volume or Area | Sample Type | Flow Rate* | Time* Start - Stop |
|--|--------------------------------|----------------|-------------|------------|--------------------|
| 1-72   |                                |                |             |            |                    |
| <b>Analyze only<br/>layers on COC<br/>72 total samples</b> |                                |                |             |            |                    |
|  |                                |                |             |            |                    |
|  |                                |                |             |            |                    |
|  |                                |                |             |            |                    |
|  |                                |                |             |            |                    |
|  |                                |                |             |            |                    |
|  |                                |                |             |            |                    |
|  |                                |                |             |            |                    |
|  |                                |                |             |            |                    |
|  |                                |                |             |            |                    |

| Relinquished by       | Date    | Time | Received by | Date        | Time     |
|-----------------------|---------|------|-------------|-------------|----------|
| <i>Michael Murphy</i> | 11/8/16 |      | <i>MC</i>   | NOV 19 2016 | 10:55 AM |

Unless scheduled, the turn around time for all samples received after 3 pm EST Friday will begin at 8 am Monday morning. Weekend or Holiday work must be scheduled ahead of time and is charged for rush turn around time. Work with standard turn around time sent Priority Overnight and Billed to Recipient will be charged a \$10 shipping fee.

Page \_\_\_ of \_\_\_

# CHAIN OF CUSTODY

104

|  |
|--|
| <b>Universal Environmental Consultants</b> |
| 12 Brewster Road                           |
| Framingham, MA 01702                       |
| Tel: (508) 628-5486 - Fax: (508) 628-5488  |
| adieb@uec-env.com                          |

Town/City: Worcester, MA Building Name: South High Community School

| Sample | Result | Description of Material                      | Sample Location                |
|--------|--------|--|--------------------------------|
| 1      |        | soft grey interior window gl                 | ENTRANCE to 101/105            |
| 2      |        | soft grey gl for small window in metal doors | c1m 161                        |
| 3      |        | 2x2 (SUSPECT) SAT-T                          | c1m 154                        |
| 4      |        | SAT-T  | OFFICE by CUST. BREAK ROOM     |
| 5      |        | MASTIC for wood Black Floor                  | c1m 157                        |
| 6      |        | Black dp for sink                            | c1m 115                        |
| 7      |        | Black dp for sink                            | c1m 111                        |
| 8      |        | red duct sealant                             | MAINTENANCE                    |
| 9      |        | GENERATOR EXHAUST                            | c. muffler end plate           |
| 10     |        | GENERATOR EXHAUST                            | c. base                        |
| 11     |        | VERTICLE TAN CAULK in cm                     | where garage meets maintenance |
| 12     |        | NOEL-SUSP (E) OFF FG                         | AC c. van closet - 11-11       |
| 13     |        | (1x1) AT-1                                   | 1ST FL main hall along 163     |
| 14     |        | Joint Compound (JC)                          | c1m 115                        |
| 15     |        | swirl finish on gyp cly                      | (elect. closet) E-10           |
| 16     |        | gyp cly #15                                  | " " "                          |
| 17     |        | WOOD FINE DOOR-TL (w/ steel fr. window)      | ENTRANCE to 135 AREAS          |
| 18     |        | VT-TL (12" MOTTEED BROWN)                    | hall c 1-10                    |
| 19     |        | MASTIC #18                                   | " "                            |
| 20     |        | VT-TL (dull lime)                            | c1m 154                        |

Reported By: Lenny R. Burns Date: 11/4/16 Due Date: 48-hr  
 Received By: [Signature] Date: 11/8/16

# CHAIN OF CUSTODY

204

|  |
|--|
| <b>Universal Environmental Consultants</b> |
| 12 Brewster Road                           |
| Framingham, MA 01702                       |
| Tel: (508) 628-5486 - Fax: (508) 628-5488  |
| adie@uec-env.com                           |

Town/City: Worcester, MA Building Name: South High Community School

| Sample | Result | Description of Material       | Sample Location                |
|--------|--------|-------------------------------|--------------------------------|
| 21     |        | MASTIC #20                    | cim 154                        |
| 22     |        | VT-II                         | cim 122                        |
| 23     |        | MASTIC #22                    | cim 122                        |
| 24     |        | VT-III 12" (Brown-Black)      | cim 121                        |
| 25     |        | MASTIC #24                    | cim 121                        |
| 26     |        | VT-IV 12" (DK Blue)           | hall by 158                    |
| 27     |        | MASTIC #26                    | " "                            |
| 28     |        | VT-V 12" mottled grey         | elect. closet E-10             |
| 29     |        | MASTIC #28                    | " "                            |
| 30     |        | soft grey win gl for int. win | ENTRANCE to 310                |
| 31     |        | VT-VII (red orange)           | hall by 313                    |
| 32     |        | MASTIC #31                    | " "                            |
| 33     |        | VT VII                        | S.W. by 349                    |
| 34     |        | MASTIC #33                    | " "                            |
| 35     |        | VT-TX (GOLD)                  | cim 328                        |
| 36     |        | MASTIC #35                    | " "                            |
| 37     |        | AT-I                          | 3 <sup>rd</sup> FL main hall   |
| 38     |        | SAT-I                         | cim 324                        |
| 39     |        | red duct sealant              | AC, MC by 351                  |
| 39(40) |        | red duct sealant              | AC, office by cust. break room |

Reported By: Leonard R. Bura Date: 11/4/16 Due Date: 48 hr

Received By: \_\_\_\_\_ Date: \_\_\_\_\_

# CHAIN OF CUSTODY

304

|   |
|---|
| Universal Environmental Consultants       |
| 12 Brewster Road                          |
| Framingham, MA 01702                      |
| Tel: (508) 628-5486 - Fax: (508) 628-5488 |
| adie@uec-env.com                          |

Town/City: Worcester, MA Building Name: South High Community School

| Sample | Result | Description of Material                              | Sample Location                            |
|--------|--------|--|--|
| 41     |        | Black coating on metal door                          | AC, MC by 328                              |
| 42     |        | Black coating on metal door                          | AC, MC by 1-31                             |
| 43     |        | Black coating on metal door                          | AC, MC by 351                              |
| 44     |        | rough finish on gyp wall                             | e. bottom edge of wall underside of stairs |
| 45     |        | JC #44   | up to 2' CFL by cust break rm              |
| 46     |        | smooth ceiling plaster (CP)                          | rm 117                                     |
| 47     |        | smooth CP  | 1-10                                       |
| 48     |        | slightly rough CP                                    | aud, from rear                             |
| 49     |        | slightly rough CP                                    | aud, from rear                             |
| 50     |        | soft grey gl for small window                        | metal door, rear of aud, entrance door     |
| 51     |        | Finish on cmu wall                                   | rm 117                                     |
| 52     |        | JC   | front of stage (aud.)                      |
| 53     |        | JC   | Guidance                                   |
| 54     |        | SAT-I  | rm 242                                     |
| 55     |        | AT-I   | 2nd FL main hall                           |
| 56     |        | residue glue daub on cmu wall, assumed for pre-exist | rm 242 chalkboard                          |
| 57     |        | Brown MASTIC for cove base                           | hall along Boys' Lockers                   |
| 58     |        | VT-I?  | CAFE                                       |
| 59     |        | MASTIC #58   | " "  |
| 60     |        | VT-II  | Teachers Dining (rm 283)                   |

Reported By: Thomas R. Bunn Date: 11/4/14 Due Date: 48 hr

Received By: \_\_\_\_\_ Date: \_\_\_\_\_

# CHAIN OF CUSTODY

|  |
|--|
| <b>Universal Environmental Consultants</b> |
| 12 Brewster Road                           |
| Framingham, MA 01702                       |
| Tel: (508) 628-5486 - Fax: (508) 628-5488  |
| adie@uec-env.com                           |

Town/City: Worcester, MA Building Name: South Community H.S.

| Sample | Result | Description of Material    | Sample Location                            |
|--------|--------|----------------------------|--|
| 61     |        | MASTIC #60                 | rm 283                                     |
| 62     |        | VT-IX                      | hall by 293                                |
| 63     |        | MASTIC #62                 | " "  |
| 64     |        | VT-IX                      | rear corridor hall to Aud.                 |
| 65     |        | MASTIC #64                 | " " "                                      |
| 66     |        | paint on beam              | Pool Bldg                                  |
| 67     |        | VERT. CAULK in cmu         | Pool Bldg                                  |
| 68     |        | ⓔ OFF FG                   | AC by 122                                  |
| 69     |        | red door sealant           | AC by 122                                  |
| 70     |        | slight rough finish on gyp | clg, underside of sw by E-12               |
| 71     |        | JC                         | main Hall c 2 <sup>nd</sup> FL, ABOVE AT-1 |
| 72     |        | residue Fireproofing       | main Hall c 2 <sup>nd</sup> FL, ABOVE AT-1 |
|        |        |                            |  |
|        |        |                            |  |
|        |        |                            |  |
|        |        |                            |  |
|        |        |                            |  |
|        |        |                            |  |
|        |        |                            |  |
|        |        |                            |  |
|        |        |                            |  |
|        |        |                            |  |
|        |        |                            |  |

Reported By: Leonard Bura Date: 11/4/16

Due Date: 48-hr

Received By: \_\_\_\_\_ Date: \_\_\_\_\_



### Test for Mercury

72-hour TAT

Town/City: Worcester, MA Building Name: South High

- 1
- 2
- 3
- 4

Due Date: \_\_\_\_\_

RECEIVED  
NOV 04 2016  
By LL 11:53

emailed for sample date - mg 11/7/16  
per client sampled on 11/3/16 - mg





**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone: (856) 303-2500 Fax: (856) 858-4571 Email: EnvChemistry2@emsl.com

Attn:

**Ammar Dieb**  
**Universal Environmental Consultants**  
**12 Brewster Road**  
**Framingham, MA 01702**

11/9/2016

Phone: (508) 628-5486  
Fax: (508) 628-5488

The following analytical report covers the analysis performed on samples submitted to EMSL Analytical, Inc. on 11/7/2016. The results are tabulated on the attached data pages for the following client designated project:

**Worcester, MA / South High**

The reference number for these samples is EMSL Order #011607529. Please use this reference when calling about these samples. If you have any questions, please do not hesitate to contact me at (856) 303-2500.

Approved By:

Phillip Worby, Chemistry Laboratory Manager



The test results contained within this report meet the requirements of NELAP and/or the specific certification program that is applicable, unless otherwise noted.  
NELAP Certifications: NJ 03036, NY 10872, PA 68-00367

The samples associated with this report were received in good condition unless otherwise noted. This report relates only to those items tested as received by the laboratory. The QC data associated with the sample results meet the recovery and precision requirements established by the NELAP, unless specifically indicated. All results for soil samples are reported on a dry weight basis, unless otherwise noted. This report may not be reproduced except in full and without written approval by EMSL Analytical, Inc.

**EMSL Analytical, Inc.**

200 Route 130 North, Cinnaminson, NJ 08077

Phone/Fax: (856) 303-2500 / (856) 858-4571

<http://www.EMSL.com>[EnvChemistry2@emsl.com](mailto:EnvChemistry2@emsl.com)

EMSL Order: 011607529

CustomerID: UEC63

CustomerPO:

ProjectID:

Attn: **Ammar Dieb**  
**Universal Environmental Consultants**  
**12 Brewster Road**  
**Framingham, MA 01702**

Phone: (508) 628-5486  
Fax: (508) 628-5488  
Received: 11/07/16 9:00 AM

Project: **Worcester, MA / South High****Analytical Results**

**Client Sample Description** 1  
Gym  
**Collected:** 11/3/2016 **Lab ID:** 0001

| Method | Parameter | Result | RL | Units | Prep Date | Analyst | Analysis Date | Analyst |
|--------|-----------|--------|----|-------|-----------|---------|---------------|---------|
| 7471B  | Mercury   | 180    | 44 | mg/Kg | 11/8/2016 | CM      | 11/8/2016     | CM      |

**Client Sample Description** 2  
Gym  
**Collected:** 11/3/2016 **Lab ID:** 0002

| Method | Parameter | Result | RL  | Units | Prep Date | Analyst | Analysis Date | Analyst |
|--------|-----------|--------|-----|-------|-----------|---------|---------------|---------|
| 7471B  | Mercury   | 51     | 4.2 | mg/Kg | 11/8/2016 | CM      | 11/8/2016     | CM      |

**Client Sample Description** 3  
Room 292  
**Collected:** 11/3/2016 **Lab ID:** 0003

| Method | Parameter | Result | RL | Units | Prep Date | Analyst | Analysis Date | Analyst |
|--------|-----------|--------|----|-------|-----------|---------|---------------|---------|
| 7471B  | Mercury   | 120    | 22 | mg/Kg | 11/8/2016 | CM      | 11/8/2016     | CM      |

**Client Sample Description** 4  
Room 293  
**Collected:** 11/3/2016 **Lab ID:** 0004

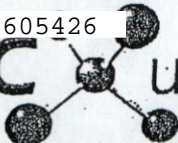
| Method | Parameter | Result | RL  | Units | Prep Date | Analyst | Analysis Date | Analyst |
|--------|-----------|--------|-----|-------|-----------|---------|---------------|---------|
| 7471B  | Mercury   | 82     | 4.6 | mg/Kg | 11/8/2016 | CM      | 11/8/2016     | CM      |

**Definitions:**

ND - indicates that the analyte was not detected at the reporting limit

RL - Reporting Limit (Analytical)



**UEC**

universal environmental consultants

12 Brewster Road  
Framingham, MA 01702

Phone: 508.628.5486

Fax: 508.628.5488

**CHAIN OF CUSTODY**BUILDING / SITE NAME: South HighTOWN / CITY: Worcester

WORK AREA: \_\_\_\_\_

STATE: MA

| Analysis Type  | Turnaround Time (x) |       |       |       |       | Specific Project Notes |
|----------------|---------------------|-------|-------|-------|-------|------------------------|
|                | 6-8 Hr              | 12 Hr | 24 Hr | 48 Hr | 72 hr |                        |
| TEM / AHERA    |                     |       |       |       |       |                        |
| TEM / Level II |                     |       |       |       |       |                        |
| TEM / Dust     |                     |       |       |       |       |                        |
| TEM / Bulk     |                     |       |       |       |       |                        |
| TEM / Water    |                     |       |       |       |       |                        |
| PLM            |                     |       |       |       |       |                        |
| Mold           |                     |       |       | X     |       |                        |
| Other:         |                     |       |       |       |       |                        |

| SAMPLE ID | MATERIAL DESCRIPTION | SAMPLE LOCATION        | START | STOP | TIME | L/MIN | VOLUME |
|-----------|----------------------|------------------------|-------|------|------|-------|--------|
| 1         | 23560211             | Ram 327                | 1515  | 1525 | 10   | 15    | 150    |
| 2         | 23560954             | Ram 338                | 1518  | 1528 | 10   | 15    | 150    |
| 3         | 23561167             | Ram 356                | 1526  | 1536 | 10   | 15    | 150    |
| 4         | 23560841             | Ram 303                | 1530  | 1540 | 10   | 15    | 150    |
| 5         | 23561062             | Ram 308                | 1537  | 1547 | 10   | 15    | 150    |
| 6         | 23560240             | Ram 212 Guidance       | 1542  | 1552 | 10   | 15    | 150    |
| 7         | 23560866             | Main office            | 1549  | 1559 | 10   | 15    | 150    |
| 8         | 23560860             | Ram 246                | 1553  | 1603 | 10   | 15    | 150    |
| 9         | 23561189             | Library                | 1602  | 1612 | 10   | 15    | 150    |
| 10        | 23560858             | Ram 233                | 1605  | 1615 | 10   | 15    | 150    |
| 11        | 23560881             | Ram 102                | 1613  | 1623 | 10   | 15    | 150    |
| 12        | 23560891             | Ram <del>418</del> 122 | 1618  | 1628 | 10   | 15    | 150    |
| 13        | 23316919             | Ram 115                | 1624  | 1634 | 10   | 15    | 150    |
| 14        | 23560865             | Ram 154                | 1629  | 1639 | 10   | 15    | 150    |
| 15        | 23560862             | Ram 158                | 1635  | 1645 | 10   | 15    | 150    |
| 16        | 23561138             | Gym                    | 1641  | 1651 | 10   | 15    | 150    |
| 17        | 23316853             | Ram 266 music          | 1646  | 1656 | 10   | 15    | 150    |
| 18        | 23316855             | Auditorium             | 1652  | 1702 | 10   | 15    | 150    |
| 19        | 23316873             | Cafeteria              | 1657  | 1707 | 10   | 15    | 150    |
| 20        | 23316906             | outside                | 1704  | 1714 | 10   | 15    | 150    |

SAMPLED BY:

Jason Becotte

DATE/TIME:

11-3-16

RECEIVED BY:

DATE/TIME:

RELINQUISHED BY:

DATE/TIME:

RECEIVED IN LAB BY:

DATE/TIME:

RECEIVED

NOV 04 2016

By JJ 11:53

WE





# EMSL Analytical, Inc.

7 Constitution Way, Suite 107 Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com / bostonlab@emsl.com>

EMSL Order: 131605426

Customer ID: UEC63

Customer PO:

Project ID:

**Attn:** Ammar Dieb  
Universal Environmental Consultants  
12 Brewster Road  
Framingham, MA 01702

**Phone:** (617) 984-9772

**Fax:** (508) 628-5488

**Collected:**

**Received:** 11/04/2016

**Analyzed:** 11/08/2016

**Project:** South High, Worcester MA

## Test Report: Air-O-Cell(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods EMSL 05-TP-003, ASTM D7391)

| Lab Sample Number:<br>Client Sample ID:<br>Volume (L):<br>Sample Location | 131605426-0001<br>1-23560211<br>150<br>Room 327 |          |            | 131605426-0002<br>2-23560954<br>150<br>Room 338 |          |            | 131605426-0003<br>3-23561167<br>150<br>Room 356 |          |            |
|---|---|----------|------------|---|----------|------------|---|----------|------------|
| Spore Types   | Raw Count                                       | Count/m³ | % of Total | Raw Count                                       | Count/m³ | % of Total | Raw Count                                       | Count/m³ | % of Total |
| Alternaria  | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Ascospores  | -   | -        | -          | 1   | 20       | 3          | 2   | 40       | 11.4       |
| Aspergillus/Penicillium   | -   | -        | -          | 2*  | 10*      | 1.5        | -   | -        | -          |
| Basidiospores   | 8   | 200      | 85.5       | 28  | 570      | 86.4       | 10  | 210      | 60         |
| Bipolaris++   | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Chaetomium  | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Cladosporium  | -   | -        | -          | 2   | 40       | 6.1        | 7   | 100      | 28.6       |
| Curvularia  | 1*  | 7*       | 3          | -   | -        | -          | -   | -        | -          |
| Epicoccum   | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Fusarium  | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Ganoderma   | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Myxomycetes++   | 1*  | 7*       | 3          | 1   | 20       | 3          | -   | -        | -          |
| Pithomyces  | 1   | 20       | 8.5        | -   | -        | -          | -   | -        | -          |
| Rust  | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Scopulariopsis  | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Stachybotrys  | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Torula  | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Ulocladium  | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Unidentifiable Spores   | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Zygomycetes   | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Total Fungi   | 11  | 234      | 100        | 34  | 660      | 100        | 19  | 350      | 100        |
| Hyphal Fragment   | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Insect Fragment   | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Pollen  | -   | -        | -          | -   | -        | -          | -   | -        | -          |
| Analyt. Sensitivity 600x  | -   | 21       | -          | -   | 21       | -          | -   | 21       | -          |
| Analyt. Sensitivity 300x  | -   | 7*       | -          | -   | 7*       | -          | -   | 7*       | -          |
| Skin Fragments (1-4)  | -   | 2        | -          | -   | 2        | -          | -   | 2        | -          |
| Fibrous Particulate (1-4)   | -   | 1        | -          | -   | 1        | -          | -   | 1        | -          |
| Background (1-5)  | -   | 1        | -          | -   | 1        | -          | -   | 1        | -          |

Bipolaris++ = Bipolaris/Drechslera/Exserohilum  
Myxomycetes++ = Myxomycetes/Periconia/Smut

No discernable field blank was submitted with this group of samples.

Steve Grise, Laboratory Manager  
or other approved signatory

High levels of background particulate can obscure spores and other particulates leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate detection and quantification. Present = Spores detected on overloaded samples. Results are not blank corrected unless otherwise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. \*\*\* Denotes particles found at 300X. "\*" Denotes not detected. Due to method stopping rules, raw counts in excess of 100 are extrapolated based on the percentage analyzed. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--EMLAP Lab 100194

Initial report from: 11/08/2016 11:40:33

For information on the fungi listed in this report, please visit the Resources section at [www.emsl.com](http://www.emsl.com)



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7 Constitution Way, Suite 107 Woburn, MA 01801

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Customer ID: UEC63

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**Attn:** Ammar Dieb  
Universal Environmental Consultants  
12 Brewster Road  
Framingham, MA 01702

**Phone:** (617) 984-9772

**Fax:** (508) 628-5488

**Collected:**

**Received:** 11/04/2016

**Analyzed:** 11/08/2016

**Project:** South High, Worcester MA

## Test Report: Air-O-Cell(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods EMSL 05-TP-003, ASTM D7391)

| Lab Sample Number:<br>Client Sample ID:<br>Volume (L):<br>Sample Location | 131605426-0004<br>4-23560841<br>150<br>Room 303 |          |            | 131605426-0005<br>5-23561062<br>150<br>Room 308 |          |            | 131605426-0006<br>6-23560240<br>150<br>Room 212 Guidance |          |            |
|---|---|----------|------------|---|----------|------------|--|----------|------------|
| Spore Types   | Raw Count                                       | Count/m³ | % of Total | Raw Count                                       | Count/m³ | % of Total | Raw Count  | Count/m³ | % of Total |
| Alternaria  | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Ascospores  | 1   | 20       | 6.1        | -   | -        | -          | 2  | 40       | 6.6        |
| Aspergillus/Penicillium   | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Basidiospores   | 15  | 310      | 93.9       | 6   | 100      | 83.3       | 27   | 550      | 90.2       |
| Bipolaris++   | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Chaetomium  | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Cladosporium  | -   | -        | -          | 1   | 20       | 16.7       | -  | -        | -          |
| Curvularia  | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Epicoccum   | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Fusarium  | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Ganoderma   | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Myxomycetes++   | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Pithomyces  | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Rust  | -   | -        | -          | -   | -        | -          | 1  | 20       | 3.3        |
| Scopulariopsis  | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Stachybotrys  | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Torula  | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Ulocladium  | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Unidentifiable Spores   | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Zygomycetes   | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Total Fungi   | 16  | 330      | 100        | 7   | 120      | 100        | 30   | 610      | 100        |
| Hyphal Fragment   | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Insect Fragment   | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Pollen  | -   | -        | -          | -   | -        | -          | -  | -        | -          |
| Analyt. Sensitivity 600x  | -   | 21       | -          | -   | 21       | -          | -  | 21       | -          |
| Analyt. Sensitivity 300x  | -   | 7*       | -          | -   | 7*       | -          | -  | 7*       | -          |
| Skin Fragments (1-4)  | -   | 2        | -          | -   | 2        | -          | -  | 2        | -          |
| Fibrous Particulate (1-4)   | -   | 1        | -          | -   | 1        | -          | -  | 1        | -          |
| Background (1-5)  | -   | 1        | -          | -   | 1        | -          | -  | 1        | -          |

Bipolaris++ = Bipolaris/Drechslera/Exserohilum  
Myxomycetes++ = Myxomycetes/Periconia/Smut

No discernable field blank was submitted with this group of samples.

Steve Grise, Laboratory Manager  
or other approved signatory

High levels of background particulate can obscure spores and other particulates leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate detection and quantification. Present = Spores detected on overloaded samples. Results are not blank corrected unless otherwise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. \*\*\* Denotes particles found at 300X. \* Denotes not detected. Due to method stopping rules, raw counts in excess of 100 are extrapolated based on the percentage analyzed. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--EMLAP Lab 100194

Initial report from: 11/08/2016 11:40:33

For information on the fungi listed in this report, please visit the Resources section at [www.emsl.com](http://www.emsl.com)



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EMSL Order: 131605426

Customer ID: UEC63

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**Attn:** Ammar Dieb  
Universal Environmental Consultants  
12 Brewster Road  
Framingham, MA 01702

**Phone:** (617) 984-9772

**Fax:** (508) 628-5488

**Collected:**

**Received:** 11/04/2016

**Analyzed:** 11/08/2016

**Project:** South High, Worcester MA

## Test Report: Air-O-Cell(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods EMSL 05-TP-003, ASTM D7391)

| Lab Sample Number:<br>Client Sample ID:<br>Volume (L):<br>Sample Location | 131605426-0007<br>7-23560866<br>150<br>Main Office |          |            | 131605426-0008<br>8-23560860<br>150<br>Room 246 |          |            | 131605426-0009<br>9-23561189<br>150<br>Library |          |            |
|---|--|----------|------------|---|----------|------------|--|----------|------------|
| Spore Types   | Raw Count  | Count/m³ | % of Total | Raw Count                                       | Count/m³ | % of Total | Raw Count                                      | Count/m³ | % of Total |
| Alternaria  | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Ascospores  | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Aspergillus/Penicillium   | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Basidiospores   | 7  | 100      | 50         | 6   | 100      | 45.5       | 2  | 40       | 66.7       |
| Bipolaris++   | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Chaetomium  | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Cladosporium  | 5  | 100      | 50         | 7   | 100      | 45.5       | 3*   | 20*      | 33.3       |
| Curvularia  | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Epicoccum   | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Fusarium  | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Ganoderma   | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Myxomycetes++   | -  | -        | -          | 1   | 20       | 9.1        | -  | -        | -          |
| Pithomyces  | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Rust  | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Scopulariopsis  | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Stachybotrys  | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Torula  | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Ulocladium  | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Unidentifiable Spores   | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Zygomycetes   | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Total Fungi   | 12   | 200      | 100        | 14  | 220      | 100        | 5  | 60       | 100        |
| Hyphal Fragment   | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Insect Fragment   | -  | -        | -          | 1*  | 7*       | -          | -  | -        | -          |
| Pollen  | -  | -        | -          | -   | -        | -          | -  | -        | -          |
| Analyt. Sensitivity 600x  | -  | 21       | -          | -   | 21       | -          | -  | 21       | -          |
| Analyt. Sensitivity 300x  | -  | 7*       | -          | -   | 7*       | -          | -  | 7*       | -          |
| Skin Fragments (1-4)  | -  | 2        | -          | -   | 2        | -          | -  | 2        | -          |
| Fibrous Particulate (1-4)   | -  | 1        | -          | -   | 1        | -          | -  | 1        | -          |
| Background (1-5)  | -  | 1        | -          | -   | 2        | -          | -  | 1        | -          |

Bipolaris++ = Bipolaris/Drechslera/Exserohilum  
Myxomycetes++ = Myxomycetes/Periconia/Smut

No discernable field blank was submitted with this group of samples.

Steve Grise, Laboratory Manager  
or other approved signatory

High levels of background particulate can obscure spores and other particulates leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate detection and quantification. Present = Spores detected on overloaded samples. Results are not blank corrected unless otherwise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. \*\*\* Denotes particles found at 300X. "\*" Denotes not detected. Due to method stopping rules, raw counts in excess of 100 are extrapolated based on the percentage analyzed. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--EMLAP Lab 100194

Initial report from: 11/08/2016 11:40:33

For information on the fungi listed in this report, please visit the Resources section at [www.emsl.com](http://www.emsl.com)



# EMSL Analytical, Inc.

7 Constitution Way, Suite 107 Woburn, MA 01801

Tel/Fax: (781) 933-8411 / (781) 933-8412

<http://www.EMSL.com / bostonlab@emsl.com>

EMSL Order: 131605426

Customer ID: UEC63

Customer PO:

Project ID:

**Attn:** Ammar Dieb  
Universal Environmental Consultants  
12 Brewster Road  
Framingham, MA 01702

**Phone:** (617) 984-9772  
**Fax:** (508) 628-5488

**Collected:**  
**Received:** 11/04/2016  
**Analyzed:** 11/08/2016

**Project:** South High, Worcester MA

## Test Report: Air-O-Cell™ Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods EMSL 05-TP-003, ASTM D7391)

| Lab Sample Number:<br>Client Sample ID:<br>Volume (L):<br>Sample Location | 131605426-0010<br>10-23560858<br>150<br>Room 233 |          |            | 131605426-0011<br>11-23560881<br>150<br>Room 102 |          |            | 131605426-0012<br>12-23560891<br>150<br>Room 122 |          |            |
|---|--|----------|------------|--|----------|------------|--|----------|------------|
| Spore Types   | Raw Count  | Count/m³ | % of Total | Raw Count  | Count/m³ | % of Total | Raw Count  | Count/m³ | % of Total |
| Alternaria  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Ascospores  | 1  | 20       | 3.5        | -  | -        | -          | -  | -        | -          |
| Aspergillus/Penicillium   | 4  | 80       | 13.9       | 1  | 20       | 9.1        | -  | -        | -          |
| Basidiospores   | 20   | 410      | 71.1       | 9  | 200      | 90.9       | 6  | 100      | 93.5       |
| Bipolaris++   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Chaetomium  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Cladosporium  | 2  | 40       | 6.9        | -  | -        | -          | 1*   | 7*       | 6.5        |
| Curvularia  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Epicoccum   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Fusarium  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Ganoderma   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Myxomycetes++   | 1*   | 7*       | 1.2        | -  | -        | -          | -  | -        | -          |
| Pithomyces  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Rust  | 1  | 20       | 3.5        | -  | -        | -          | -  | -        | -          |
| Scopulariopsis  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Stachybotrys  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Torula  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Ulocladium  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Unidentifiable Spores   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Zygomycetes   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Total Fungi   | 29   | 577      | 100        | 10   | 220      | 100        | 7  | 107      | 100        |
| Hyphal Fragment   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Insect Fragment   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Pollen  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Analyt. Sensitivity 600x  | -  | 21       | -          | -  | 21       | -          | -  | 21       | -          |
| Analyt. Sensitivity 300x  | -  | 7*       | -          | -  | 7*       | -          | -  | 7*       | -          |
| Skin Fragments (1-4)  | -  | 2        | -          | -  | 2        | -          | -  | 2        | -          |
| Fibrous Particulate (1-4)   | -  | 1        | -          | -  | 1        | -          | -  | 2        | -          |
| Background (1-5)  | -  | 2        | -          | -  | 1        | -          | -  | 1        | -          |

Bipolaris++ = Bipolaris/Drechslera/Exserohilum  
Myxomycetes++ = Myxomycetes/Periconia/Smut

No discernable field blank was submitted with this group of samples.

Steve Grise, Laboratory Manager  
or other approved signatory

High levels of background particulate can obscure spores and other particulates leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate detection and quantification. Present = Spores detected on overloaded samples. Results are not blank corrected unless otherwise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. \*\*\* Denotes particles found at 300X. "\*" Denotes not detected. Due to method stopping rules, raw counts in excess of 100 are extrapolated based on the percentage analyzed. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted.

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Initial report from: 11/08/2016 11:40:33

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**Received:** 11/04/2016

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**Project:** South High, Worcester MA

## Test Report: Air-O-Cell(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods EMSL 05-TP-003, ASTM D7391)

| Lab Sample Number:<br>Client Sample ID:<br>Volume (L):<br>Sample Location | 131605426-0013<br>13-23316919<br>150<br>Room 115 |          |            | 131605426-0014<br>14-23560865<br>150<br>Room 154 |          |            | 131605426-0015<br>15-23560862<br>150<br>Room 158 |          |            |
|---|--|----------|------------|--|----------|------------|--|----------|------------|
| Spore Types   | Raw Count  | Count/m³ | % of Total | Raw Count  | Count/m³ | % of Total | Raw Count  | Count/m³ | % of Total |
| Alternaria  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Ascospores  | -  | -        | -          | 2  | 40       | 5.6        | -  | -        | -          |
| Aspergillus/Penicillium   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Basidiospores   | 1  | 20       | 74.1       | 33   | 680      | 94.4       | 4  | 80       | 100        |
| Bipolaris++   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Chaetomium  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Cladosporium  | 1*   | 7*       | 25.9       | -  | -        | -          | -  | -        | -          |
| Curvularia  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Epicoccum   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Fusarium  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Ganoderma   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Myxomycetes++   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Pithomyces  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Rust  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Scopulariopsis  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Stachybotrys  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Torula  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Ulocladium  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Unidentifiable Spores   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Zygomycetes   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Total Fungi   | 2  | 27       | 100        | 35   | 720      | 100        | 4  | 80       | 100        |
| Hyphal Fragment   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Insect Fragment   | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Pollen  | -  | -        | -          | -  | -        | -          | -  | -        | -          |
| Analyt. Sensitivity 600x  | -  | 21       | -          | -  | 21       | -          | -  | 21       | -          |
| Analyt. Sensitivity 300x  | -  | 7*       | -          | -  | 7*       | -          | -  | 7*       | -          |
| Skin Fragments (1-4)  | -  | 1        | -          | -  | 2        | -          | -  | 1        | -          |
| Fibrous Particulate (1-4)   | -  | 1        | -          | -  | 1        | -          | -  | 1        | -          |
| Background (1-5)  | -  | 1        | -          | -  | 1        | -          | -  | 1        | -          |

Bipolaris++ = Bipolaris/Drechslera/Exserohilum  
Myxomycetes++ = Myxomycetes/Periconia/Smut

No discernable field blank was submitted with this group of samples.

Steve Grise, Laboratory Manager  
or other approved signatory

High levels of background particulate can obscure spores and other particulates leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate detection and quantification. Present = Spores detected on overloaded samples. Results are not blank corrected unless otherwise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. \*\*\* Denotes particles found at 300X. "\*" Denotes not detected. Due to method stopping rules, raw counts in excess of 100 are extrapolated based on the percentage analyzed. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted.

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Received: 11/04/2016

Analyzed: 11/08/2016

Project: South High, Worcester MA

## Test Report: Air-O-Cell(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods EMSL 05-TP-003, ASTM D7391)

| Lab Sample Number:<br>Client Sample ID:<br>Volume (L):<br>Sample Location | 131605426-0016<br>16-23561138<br>150<br>Gym |          |            | 131605426-0017<br>17-23316853<br>150<br>Room 266 Music |          |            | 131605426-0018<br>18-23316855<br>150<br>Auditorium |          |            |
|---|---|----------|------------|--|----------|------------|--|----------|------------|
| Spore Types   | Raw Count                                   | Count/m³ | % of Total | Raw Count  | Count/m³ | % of Total | Raw Count  | Count/m³ | % of Total |
| Alternaria  | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Ascospores  | 2   | 40       | 3.4        | -  | -        | -          | -  | -        | -          |
| Aspergillus/Penicillium   | -   | -        | -          | 3  | 60       | 32.1       | 8  | 200      | 20         |
| Basidiospores   | 55  | 1100     | 93.2       | 6  | 100      | 53.5       | 36   | 740      | 74         |
| Bipolaris++   | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Chaetomium  | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Cladosporium  | 2   | 40       | 3.4        | -  | -        | -          | 3  | 60       | 6          |
| Curvularia  | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Epicoccum   | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Fusarium  | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Ganoderma   | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Myxomycetes++   | -   | -        | -          | 1  | 20       | 10.7       | -  | -        | -          |
| Pithomyces  | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Rust  | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Scopulariopsis  | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Stachybotrys  | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Torula  | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Ulocladium  | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Unidentifiable Spores   | -   | -        | -          | 1*   | 7*       | 3.7        | -  | -        | -          |
| Zygomycetes   | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Total Fungi   | 59  | 1180     | 100        | 11   | 187      | 100        | 47   | 1000     | 100        |
| Hyphal Fragment   | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Insect Fragment   | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Pollen  | -   | -        | -          | -  | -        | -          | -  | -        | -          |
| Analyt. Sensitivity 600x  | -   | 21       | -          | -  | 21       | -          | -  | 21       | -          |
| Analyt. Sensitivity 300x  | -   | 7*       | -          | -  | 7*       | -          | -  | 7*       | -          |
| Skin Fragments (1-4)  | -   | 2        | -          | -  | 2        | -          | -  | 1        | -          |
| Fibrous Particulate (1-4)   | -   | 1        | -          | -  | 1        | -          | -  | 1        | -          |
| Background (1-5)  | -   | 2        | -          | -  | 3        | -          | -  | 1        | -          |

Bipolaris++ = Bipolaris/Drechslera/Exserohilum  
 Myxomycetes++ = Myxomycetes/Periconia/Smut

No discernable field blank was submitted with this group of samples.

Steve Grise, Laboratory Manager  
or other approved signatory

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Collected:

Received: 11/04/2016

Analyzed: 11/08/2016

Project: South High, Worcester MA

## Test Report: Air-O-Cell(™) Analysis of Fungal Spores & Particulates by Optical Microscopy (Methods EMSL 05-TP-003, ASTM D7391)

| Lab Sample Number:        | 131605426-0019 | 131605426-0020 |            |
|---------------------------|----------------|----------------|------------|
| Client Sample ID:         | 19-23316873    | 20-23316906    |            |
| Volume (L):               | 150            | 150            |            |
| Sample Location           | Cafeteria      | Outside        |            |
| Spore Types               | Raw Count      | Count/m³       | % of Total |
| Alternaria                | -              | -              | -          |
| Ascospores                | 1              | 20             | 5.7        |
| Aspergillus/Penicillium   | -              | -              | -          |
| Basidiospores             | 15             | 310            | 88.6       |
| Bipolaris++               | -              | -              | -          |
| Chaetomium                | -              | -              | -          |
| Cladosporium              | 1              | 20             | 5.7        |
| Curvularia                | -              | -              | -          |
| Epicoccum                 | -              | -              | -          |
| Fusarium                  | -              | -              | -          |
| Ganoderma                 | -              | -              | -          |
| Myxomycetes++             | -              | -              | -          |
| Pithomyces                | -              | -              | -          |
| Rust                      | -              | -              | -          |
| Scopulariopsis            | -              | -              | -          |
| Stachybotrys              | -              | -              | -          |
| Torula                    | -              | -              | -          |
| Ulocladium                | -              | -              | -          |
| Unidentifiable Spores     | -              | -              | -          |
| Zygomycetes               | -              | -              | -          |
| <b>Total Fungi</b>        | <b>17</b>      | <b>350</b>     | <b>100</b> |
| Hyphal Fragment           | -              | -              | -          |
| Insect Fragment           | -              | -              | -          |
| Pollen                    | -              | -              | -          |
| Analyt. Sensitivity 600x  | -              | 21             | -          |
| Analyt. Sensitivity 300x  | -              | 7*             | -          |
| Skin Fragments (1-4)      | -              | 2              | -          |
| Fibrous Particulate (1-4) | -              | 1              | -          |
| Background (1-5)          | -              | 1              | -          |

Bipolaris++ = Bipolaris/Drechslera/Exserohilum  
 Myxomycetes++ = Myxomycetes/Periconia/Smut

No discernable field blank was submitted with this group of samples.

Steve Grise, Laboratory Manager  
or other approved signatory

High levels of background particulate can obscure spores and other particulates leading to underestimation. Background levels of 5 indicate an overloading of background particulates, prohibiting accurate detection and quantification. Present = Spores detected on overloaded samples. Results are not blank corrected unless otherwise noted. The detection limit is equal to one fungal spore, structure, pollen, fiber particle or insect fragment. \*\*\* Denotes particles found at 300X. "\*" Denotes not detected. Due to method stopping rules, raw counts in excess of 100 are extrapolated based on the percentage analyzed. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC--EMLAP Lab 100194

Initial report from: 11/08/2016 11:40:33

For information on the fungi listed in this report, please visit the Resources section at [www.emsl.com](http://www.emsl.com)

NELAC NY 11769  
NRPP 101193 AL  
NRSB ARL0017EPA Method #402-R-92-004  
Liquid Scintillation  
NRPP Device Code 8088  
NRSB Device Code 12193

## Laboratory Report for:

Property Tested: Project # South High Community

Universal Environmental Consultant  
12 Brewster Road  
Framingham MA 01702High School  
Not Indicated 3263368 3263355  
Worcester MA

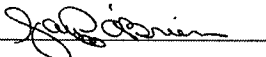
| Log Number | Device Number | Test Exposure Duration: |                    | Area Tested                           | Result (pCi/L) |
|------------|---------------|-------------------------|--------------------|---------------------------------------|----------------|
| 2007660    | 3263368       | 11/02/2016 2:45 pm      | 11/04/2016 4:12 pm | First Floor C RM 161                  | 4.1            |
| 2007661    | 3263353       | 11/02/2016 2:48 pm      | 11/04/2016 4:09 pm | First Floor C RM 114 OV. SR.          | 0.6            |
| 2007662    | 3263348       | 11/02/2016 2:51 pm      | 11/04/2016 4:16 pm | First Floor C RM 121                  | 1.0            |
| 2007663    | 3263356       | 11/02/2016 2:53 pm      | 11/04/2016 4:18 pm | First Floor C RM 122                  | 0.9            |
| 2007664    | 3263349       | 11/02/2016 2:56 pm      | 11/04/2016 4:23 pm | First Floor C RM Outside 152 Entrance | 0.9            |
| 2007665    | 3263346       | 11/02/2016 2:58 pm      | 11/04/2016 4:30 pm | First Floor C RM 101 BR CABINET       | < 0.4          |
| 2007666    | 3263354       | 11/02/2016 3:05 pm      | 11/04/2016 4:32 pm | First Floor C RM 105 ABC'S            | < 0.4          |
| 2007667    | 3263358       | 11/02/2016 3:08 pm      | 11/04/2016 4:34 pm | First Floor C RM 158                  | 1.1            |
| 2007668    | 3263352       | 11/02/2016 3:09 pm      | 11/04/2016 4:35 pm | First Floor C RM 157 STOOGES          | 0.8            |
| 2007669    | 3263347       | 11/02/2016 3:12 pm      | 11/04/2016 4:37 pm | First Floor CRM 155 CORE              | 0.8            |

**Comment:** Universal Environmental Consultant was emailed a copy of this report.

Test Performed By: Leonard Busa

Distributed by: Universal Environmental Consultant

Date Received: 11/08/2016 Date Logged: 11/08/2016 Date Analyzed: 11/08/2016 Date Reported: 11/09/2016

Report Reviewed By: Report Approved By: **Disclaimer:**

The uncertainty of this radon measurement is ~+/- 10 %. Factors contributing to uncertainty include statistical variations, daily and seasonal variations in radon concentrations, sample collection techniques and operation of the dwelling. Interference with test conditions may influence the test results.

This report may only be transferred to a third party in its entirety. Analytical results relate to the samples AS RECEIVED BY THE LABORATORY. Results shown on this report represent levels of radon gas measured between the dates shown in the room or area of the site identified above as "Property Tested". Incorrect information will affect results. The results may not be construed as either predictive or supportive of measurements conducted in any area of this structure at any other time. AccuStar Labs, its employees and agents are not responsible for the consequences of any action taken or not taken based upon the results reported or any verbal or written interpretation of the results.

NELAC NY 11769  
NRPP 101193 AL  
NRSB ARL0017

EPA Method #402-R-92-004  
Liquid Scintillation  
NRPP Device Code 8088  
NRSB Device Code 12193

Laboratory Report for:

Property Tested: Project # South High Community

Universal Environmental Consultant  
12 Brewster Road  
Framingham MA 01702

High School  
Not Indicated 3263368 3263355  
Worcester MA

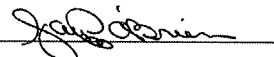
| Log Number | Device Number | Test Exposure Duration: |                    | Area Tested                        | Result (pCi/L) |
|------------|---------------|-------------------------|--------------------|------------------------------------|----------------|
| 2007670    | 3263357       | 11/02/2016 3:16 pm      | 11/04/2016 4:21 pm | First Floor 151 Office             | 6.5            |
| 2007671    | 3263338       | 11/02/2016 3:19 pm      | 11/04/2016 4:26 pm | First Floor Cutsodial Closet J11   | 0.5            |
| 2007672    | 3263340       | 11/02/2016 3:22 pm      | 11/04/2016 4:27 pm | First Floor Storage Room G11       | 0.5            |
| 2007673    | 3263337       | 11/02/2016 3:25 pm      | 11/04/2016 4:00 pm | First Floor Hall by 163            | 0.9            |
| 2007674    | 3263359       | 11/02/2016 3:26 pm      | 11/04/2016 4:04 pm | First Floor Room 117 LOUNGE        | 0.4            |
| 2007675    | 3263339       | 11/02/2016 3:28 pm      | 11/04/2016 4:03 pm | First Floor Custodial Closet J10   | 1.1            |
| 2007676    | 3263350       | 11/02/2016 3:30 pm      | 11/04/2016 3:59 pm | First Floor Office in front of 161 | 1.2            |
| 2007677    | 3263360       | 11/02/2016 3:32 pm      | 11/04/2016 4:01 pm | First Floor E12                    | 2.5            |
| 2007678    | 3263351       | 11/02/2016 3:38 pm      | 11/04/2016 4:06 pm | First Floor C RM 115               | 0.6            |
| 2007679    | 3263355       | 11/02/2016 3:36 pm      | 11/04/2016 4:08 pm | First Floor CRM 114 SPANISH        | 0.4            |

**Comment:** Universal Environmental Consultant was emailed a copy of this report.

Test Performed By: Leonard Busa

Distributed by: Universal Environmental Consultant

Date Received: 11/08/2016 Date Logged: 11/08/2016 Date Analyzed: 11/08/2016 Date Reported: 11/09/2016

Report Reviewed By: 

Report Approved By: 

**Disclaimer:**

The uncertainty of this radon measurement is ~+/- 10 %. Factors contributing to uncertainty include statistical variations, daily and seasonal variations in radon concentrations, sample collection techniques and operation of the dwelling. Interference with test conditions may influence the test results.

This report may only be transferred to a third party in its entirety. Analytical results relate to the samples AS RECEIVED BY THE LABORATORY. Results shown on this report represent levels of radon gas measured between the dates shown in the room or area of the site identified above as "Property Tested". Incorrect information will affect results. The results may not be construed as either predictive or supportive of measurements conducted in any area of this structure at any other time. AccuStar Labs, its employees and agents are not responsible for the consequences of any action taken or not taken based upon the results reported or any verbal or written interpretation of the results.

# **APPENDIX K**

## **STORMWATER POLLUTION PREVENTION PLAN**

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THIS PAGE INTENTIONALLY LEFT BLANK**

# Stormwater Pollution Prevention Plan (SWPPP)

## For Construction Activities At:

### **Worcester South High Community School**

170 Apricot Street

Worcester, MA 01603

Site Telephone Number: xxx-xxx-xxxx

## SWPPP Prepared For:

### **Lamoureux Pagano Associates**

108 Grove Street, Suite 300

Worcester, MA 01605

T: 508-752-2831

F: 508-757-7769

## SWPPP Prepared By:

### **Nitsch Engineering**

120 Front Street

Worcester, MA 01608

T: 617-338-0063

F: 617-338-6472

## SWPPP Preparation Date:

**04 / 12 / 18**

## Estimated Project Dates:

Project Start Date: xx/xx/xxxx

Project Completion Date: xx/xx/xxxx



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## SECTION 1: CONTACT INFORMATION/RESPONSIBLE PARTIES

### 1.1 *Operator(s) / Subcontractor(s)*

#### Operator(s):

##### **Construction Manager Responsibilities:**

Fontaine Brothers shall maintain the Stormwater Pollution Prevention Plan (SWPPP) documentation and will conduct and document self-inspections required under the 2017 Construction General Permit (CGP) once every 7 days and within 24 hours of a storm event 0.25" or greater. Fontaine Brothers will provide copies of inspections reports to the Owner's Representative within 24 hours following each inspection. Incidents of non-compliance will be immediately brought to the attention of the Owner's Representative. Fontaine Brothers shall be responsible for maintaining compliance with the SWPPP, including all requirements in the CGP and will maintain erosion and sediment control Best Management Practices (BMPs) in all areas of the site under its day-to-day control.

Fontaine Brothers shall file a Notice of Intent (NOI) to be covered by the CGP and obtain coverage by the Environmental Protection Agency (EPA) before beginning construction at the project. Permit coverage will be maintained throughout the project. Fontaine Brothers shall not file a Notice of Termination (NOT) until all disturbed areas of the site under its day-to-day control have been fully stabilized with permanent erosion controls that satisfy the final stabilization requirements in the CGP or have met another criteria of the NOT. Fontaine Brothers will maintain a clean site and construction trash and debris will be picked up and disposed of properly by the end of each day.

Each Operator is responsible for advising employees and subcontractors working on this project of the requirements in the CGP and SWPPP. Particular emphasis should be placed on ensuring that employees and subcontractors do not damage BMPs and maintain compliance with the CGP.

Fontaine Brothers  
Davide Fontaine, Jr, Vice President  
510 Cottage Street  
Springfield, MA 01104  
T: 413-781-2020  
**Email address:**

**Owner's Representative Responsibilities:**

**Owner's Representative** shall provide general oversight of the project including review of the SWPPP and any amendments, inspection reports, and corrective actions. **Owner's Representative** shall file a NOI to be covered by the CGP and obtain coverage by the EPA before beginning construction at the project. Permit coverage will be maintained throughout the project. **Owner's Representative** shall not file a notice of Termination until all disturbed areas of the site have been fully stabilized with permanent erosion controls that satisfy the final stabilization requirements in the CGP. **Owner's Representative** will coordinate with the **Fontaine Brothers** to maintain a clean site so that trash and debris will be picked up and disposed of properly by the end of the day.

Each Operator is responsible for advising employees and subcontractors working on this project of the requirements in the CGP and SWPPP. Particular emphasis should be placed on ensuring that employees and subcontractors do not damage BMPs and maintain compliance with the CGP.

**Owner's Representative Company Name**

**Owner's Representative Contact person, Position**

**Street Address**

**Town, State, Zip Code**

**T: xxx-xxx-xxxx**

**Email Address:**

**Site Contractor(s):**

**Company Name**

**Contact person, Position**

**Street Address**

**Town, State, Zip Code**

**T: xxx-xxx-xxxx**

**Email Address:**

**If there is more than one Site Contractor conducting earth disturbing activities then list them all here.**

**Emergency 24-Hour Contact:**

**Company**

**Emergency Contact person, Position**

**T: xxx-xxx-xxxx**

## 1.2 Stormwater Team

### **Construction Manager: Fontaine Brothers**

**Stormwater Role/Responsibility:** Responsible for overseeing the development of the SWPPP, modifications and updates to the SWPPP, and for compliance with the requirements in the CGP (e.g., installing and maintaining stormwater controls, conducting site inspections, picking up trash, taking corrective actions where required, etc.).

**Contact:**

Davide Fontaine, Jr. , Vice President

T: xxx-xxx-xxxx

Email address

I, David Fontaine, have read the CGP and Understand the Applicable Requirements

☐ Yes

Date: \_\_\_\_\_

### **Site Contractor: Company**

**Stormwater Role/Responsibility:** Responsible for compliance with the requirements in this permit (e.g., installing and maintaining stormwater controls, conducting site inspections, taking corrective actions where required, etc.).

**Contact:**

Contact Person, Position

T: xxx-xxx-xxxx

Email Address

Refer to the Subcontractor Certifications/Agreements in Attachment G.

**Add more companies to the team as needed**

## SECTION 2: SITE EVALUATION, ASSESSMENT, AND PLANNING

### 2.1 Project/Site Information

#### Project Name and Address

Project/Site Name: Worcester South Community High  
Project Street/Location: 170 Apricot Street  
City/Town: Worcester  
State: Massachusetts  
ZIP Code: 01603  
County or Similar Subdivision: Worcester

#### Project Latitude/Longitude

(Use **one** of three possible formats, and specify method)

Latitude: Longitude:  
1. 42.2442° (degrees, decimals) 1. 71.8640° (degrees, decimals)

Method for determining latitude/longitude:

☐ USGS topographic map (specify scale: \_\_\_\_\_) ☐ GPS  
☒ Other (please specify): Google Maps

Horizontal Reference Datum:

☐ NAD 27 ☐ NAD 83 ☒ WGS 84

If you used a U.S.G.S topographic map, what was the scale? \_\_\_\_\_

---

#### Additional Project Information

Is the project/site located on Indian country lands, or located on a property of religious or cultural significance to an Indian tribe? ☐ Yes ☒ No

Are you applying for permit coverage as a "federal operator" as defined in Appendix A of the CGP?  
☐ Yes ☒ No

Will there be demolition of any structure built or renovated before January 1, 1980?

☒ Yes ☐ No

If yes, do any of the structures being demolished have at least 10,000 square feet of floor space?

☒ Yes ☐ No

Was pre-development land use used for agriculture (see Appendix A of the CGP for definition of "agricultural land")?

☐ Yes ☒ No

Type of Construction Site (check all that apply): ☐ Single-Family Residential

☐ Multi-Family Residential ☐ Commercial ☐ Industrial ☒ Institutional ☐ Highway or Road  
☐ Utility ☐ Other \_\_\_\_\_

**2.2 Discharge Information**

Does your project/site discharge stormwater into a Municipal Separate Storm Sewer System (MS4)?

☐ Yes    ☒ No

Are there any surface waters that are located within 50 feet of your construction disturbances?

☒ Yes    ☐ No

**Table 1 – Names of Receiving Waters**

|  |
|--|
| Name(s) of the first surface water that receives stormwater directly from your site and/or from the MS4 (note: multiple rows provided where your site has more than one point of discharge that flows to different surface waters) |
| <b>001.Curtis Pond</b>   |
| <b>002.Beaver Brook</b>  |
| <b>003.</b>  |

**Table 2 – Impaired Waters / TMDLs** (Answer the following for each surface water listed in Table 1 above)

|             | Is this surface water listed as "impaired" on the CWA303(d) list?   | If you answered yes, then answer the following: |   |                            |  |
|-------------|---|---|---|----------------------------|--|
|             |   | What pollutant(s) are causing the impairment?   | Has a TMDL been completed?  | Title of the TMDL document | Pollutant(s) for which there is a TMDL |
| <b>001.</b> | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO |   | <input type="checkbox"/> YES <input type="checkbox"/> NO            |                            |  |
| <b>002.</b> | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO | <b>Sediment, Pathogens, Taste/Color/Odor</b>    | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO |                            |  |
| <b>003.</b> | <input type="checkbox"/> YES <input type="checkbox"/> NO            |   | <input type="checkbox"/> YES <input type="checkbox"/> NO            |                            |  |

**Table 3 – Tier 2, 2.5, or 3 Waters** (Answer the following for each surface water listed in Table 1 above)

|             | Is this surface water designated as a Tier 2, Tier 2.5, or Tier 3 water? | If you answered yes, specify which Tier (2, 2.5, or 3) the surface water is designated as? |
|-------------|--|--|
| <b>001.</b> | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO      |  |
| <b>002.</b> | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO      | Tier 2- High Quality Water   |
| <b>003.</b> | <input type="checkbox"/> YES <input type="checkbox"/> NO                 |  |





## **2.3 Nature of the Construction Activity**

### **General Description of Project**

Provide a general description of the construction project:

The project consists of the demolition of the existing high school building and associated parking and roadway areas. A new high school building will be constructed along with new roadways, retaining walls, and parking lots. A new stormwater management system will be constructed on the site. The existing softball/baseball fields will be reconstructed.

### **Size of Construction Project**

Size of Property: 43 acres

Total Area of Construction Disturbances: 28 acres

Maximum Area to be Disturbed at Any One Time: 28 acres

### **Construction Support Activities**

Include a description of the construction support activities or reference Site Maps in Attachment A that include this information.

Contact Information for Construction Support Activity:

Name: XXX

Telephone: XXX-XXX-XXXX

Email: XXXX

Address and/or Latitude and Longitude:

### **Business Hours**

Day-Day Xa.m-Xp.m.

## **2.4 Sequence and Estimated Dates of Construction Activities**

### **Phase I: Installation of Erosion and Sedimentation Control Measures**

- Description
- Schedule: Month, Day Year – Month, Day Year
- Area Disturbed During Phase: xx acres
- Description of stormwater controls that will be installed/maintained during phase

### **Phase II: Construction of new high school building**

- Description
- Schedule: Month, Day Year – Month, Day Year
- Area Disturbed During Phase: xx acres
- Description of stormwater controls that will be installed/maintained during phase

### **Phase III: Demolition of existing high school building**

- Description
- Schedule: Month, Day Year – Month, Day Year
- Area Disturbed During Phase: xx acres
- Description of stormwater controls that will be installed/maintained during phase

### **Phase IV: Construction of new fields**

- Description
- Schedule: Month, Day Year – Month, Day Year
- Area Disturbed During Phase: xx acres
- Description of stormwater controls that will be installed/maintained during phase

## 2.5 Allowable Non-Stormwater Discharges

### List of Allowable Non-Stormwater Discharges Present at the Site

| Type of Allowable Non-Stormwater Discharge  | Likely to be Present at Your Site?                                  |
|---|---|
| Discharges from emergency fire-fighting activities  | <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO |
| Fire hydrant flushings  | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |
| Landscape irrigation  | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |
| Waters used to wash vehicles and equipment, provided that there is no discharge of soaps, solvents, or detergents used for such purposes  | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |
| Water used to control dust  | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |
| Potable water including uncontaminated water line flushings   | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |
| External building washdown, provided soaps, solvents, and detergents are not used, and external surfaces do not contain hazardous substances (as defined in Appendix A of the CGP) (e.g., paint or caulk containing polychlorinated biphenyls (PCBs)) | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |
| Pavement wash waters, provided spills or leaks of toxic or hazardous substances have not occurred (unless all spill material has been removed) and where soaps, solvents, and detergents are not used.  | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |
| Uncontaminated air conditioning or compressor condensate  | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |
| Uncontaminated, non-turbid discharges of ground water or spring water   | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |
| Foundation or footing drains where flows are not contaminated with process materials such as solvents or contaminated groundwater   | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |
| Construction dewatering water discharged in accordance with Part 2.4 of the CGP   | <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO |

Note: You are prohibited from directing pavement wash waters directly into any water of the U.S., storm drain inlet, or stormwater conveyance, unless the conveyance is connected to a sediment basin, sediment trap, or similarly effective control.

## **2.6     *Site Maps***

Refer to Attachment A

## SECTION 3: DOCUMENTATION OF COMPLIANCE WITH OTHER FEDERAL REQUIREMENTS

### 3.1 *Endangered Species Protection*

#### Eligibility Criterion

Under which criterion listed in Appendix D of the CGP are you eligible for coverage under this permit?

☒ **A**      ☐ **B**      ☐ **C**      ☐ **D**      ☐ **E**

For reference purposes, the eligibility criteria listed in Appendix D of the CGP are as follows:

**Criterion A.** No federally-listed threatened or endangered species or their designated critical habitat(s) are likely to occur in your site's "action area" as defined in Appendix A of the CGP.

**Criterion B.** The construction site's discharges and discharge-related activities were already addressed in another operator's valid certification of eligibility for your action area under eligibility Criterion A, C, D, E, or F and there is no reason to believe that federally-listed species or federally-designated critical habitat not considered in the prior certification may be present or located in the "action area". To certify your eligibility under this Criterion, there must be no lapse of NPDES permit coverage in the other operator's certification. By certifying eligibility under this Criterion, you agree to comply with any effluent limitations or conditions upon which the other operator's certification was based. You must include in your NOI the tracking number from the other operator's notification of authorization under this permit. If your certification is based on another operator's certification under Criterion C, you must provide EPA with the relevant supporting information required of existing dischargers in Criterion C in your NOI form.

**Criterion C.** Federally-listed threatened or endangered species or their designated critical habitat(s) are likely to occur in or near your site's "action area," and your site's discharges and discharge-related activities are not likely to adversely affect listed threatened or endangered species or critical habitat. This determination may include consideration of any stormwater controls and/or management practices you will adopt to ensure that your discharges and discharge-related activities are not likely to adversely affect listed species and critical habitat. To make this certification, you must include the following in your NOI: 1) any federally listed species and/or designated habitat located in your "action area"; and 2) the distance between your site and the listed species or designated critical habitat (in miles). You must also include a copy of your site map with your NOI.

**Criterion D.** Coordination between you and the Services has been concluded. The coordination must have addressed the effects of your site's discharges and discharge-related activities on federally-listed threatened or endangered species and federally-designated critical habitat, and must have resulted in a written concurrence from the relevant Service(s) that your site's discharges and discharge-related activities are not likely to adversely affect listed species or critical habitat. You must include copies of the correspondence between yourself and the Services in your SWPPP and your NOI.

**Criterion E.** Consultation between a Federal Agency and the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service under section 7 of the ESA has been concluded. The consultation must have addressed the effects of the construction site's discharges and discharge-related activities on federally-listed threatened or endangered species and federally-designated critical habitat. The result of this consultation must be either:

- i. a biological opinion that concludes that the action in question (taking into account the effects of your site's discharges and discharge-related activities) is not likely to jeopardize the continued existence of listed species, nor the destruction or adverse modification of critical habitat; or
- ii. written concurrence from the applicable Service(s) with a finding that the site's discharges and discharge-related activities are not likely to adversely affect federally-listed species or federally-designated habitat.

You must include copies of the correspondence between yourself and the Services in your SWPPP and your NOI.

**Criterion F.** Your construction activities are authorized through the issuance of a permit under section 10 of the ESA, and this authorization addresses the effects of the site's discharges and discharge-related activities on federally-listed species and federally-designated critical habitat. You must include copies of the correspondence between yourself and the Services in your SWPPP and your NOI.

**For criterion A,** indicate the basis for your determination that no federally-listed threatened or endangered species or their designated critical habitat(s) are likely to occur in your site's action area (as defined in Appendix A of the CGP). Check the applicable source of information you relied upon:

- ☐ Specific communication with staff of the U.S. Fish & Wildlife Service or National Marine Fisheries Service.
- ☐ Publicly available species list.
- ☒ Other source: NHESP data layer (August 2017 or as amended) from MassGIS, U.S. Fish and Wildlife online system Information for Planning and Conservation (IPaC) – Refer to Attachment K.

### 3.2 *Historic Preservation*

#### **Appendix E (of the CGP), Step 1**

Do you plan on installing any of the following stormwater controls at your site? Check all that apply below, and proceed to Appendix E, Step 2.

- ☐ Dike
- ☐ Berm
- ☒ Catch Basin
- ☐ Pond
- ☐ Stormwater Conveyance Channel (e.g., ditch, trench, perimeter drain, swale, etc.)
- ☐ Culvert
- ☒ Other type of ground-disturbing stormwater control: Water Quality Structures, Outlet Control Structure, Subsurface Infiltration System, Drain Manhole

If you will not be installing any ground-disturbing stormwater controls, no further documentation is required for Section 3.2 of the Template.

## Appendix E, Step 2

If you answered yes in Step 1, have prior cultural resource surveys or other evaluations determined that historic properties do not exist, or that prior disturbances at the site have precluded the existence of historic properties? ☒ YES ☐ NO

### 3.3 *Safe Drinking Water Act Underground Injection Control Requirements*

Do you plan to install any of the following controls? Check all that apply below.

- ☐ Infiltration trenches (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system);
- ☒ Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate stormwater flow; and
- ☐ Drywells, seepage pits, or improved sinkholes (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

If one or more of the above apply, then, INSERT COPIES OF LETTERS, EMAILS, OR OTHER COMMUNICATION BETWEEN YOU AND THE STATE AGENCY OR EPA REGIONAL OFFICE

## SECTION 4: EROSION AND SEDIMENT CONTROLS REQUIREMENTS

Section 4 of this document describes the stormwater controls that will be implemented throughout construction. The operator must install and maintain all stormwater controls in compliance with Parts 2.2 and 2.3 of the CGP. The operator must install stormwater controls by the time construction activity in any given portion of the site begins.

The stormwater controls shall be designed and installed in accordance with good engineering practices and applicable design specifications. Specifications titled "312500- Erosion and Sedimentation Controls," dated \*\*\*\*\* and prepared by Nitsch Engineering and details titled "Erosion and Sedimentation Control Details," dated \*\*\*\*\* and prepared by Nitsch Engineering have been provided to the contractor under separate cover.

### 4.1 Natural Buffers or Equivalent Sediment Controls

#### Buffer Compliance Alternatives

Are there any surface waters within 50 feet of your project's earth disturbances? ☐ YES ☒ NO

(Note: If no, no further documentation is required for Part 4.1 in the SWPPP Template. Continue to Part 4.2.)

### 4.2 Perimeter Controls

#### General

The site will be enclosed by a temporary construction fence as shown on the Erosion and Sedimentation Control Plan in Attachment A. Construction gates will be located at the entrance to the site as shown on the Erosion and Sedimentation Control Plan and all entrances will have stabilized construction entrances. All gates and entrances to the site will be secured during non-working hours. The areas of the site that will receive pollutant discharges will be surrounded by a Specific Perimeter Control listed below as shown on the Erosion and Sedimentation Control Plan in Attachment A. Sediment tracked offsite must be removed by the end of the same workday.

#### Specific Perimeter Controls

##### Perimeter Control # 1

- BMP Description: Silt Fence.
- Installation Schedule: Prior to the Start of Construction.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.  
Remove any sediment before it has accumulated to one-half of the above-ground height of any perimeter control.
- Responsible Staff: Construction Manager and Site Contractor(s).

##### Perimeter Control # 2

- BMP Description: Silt Fence with Wattles.
- Installation Schedule: Prior to the Start of Construction.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.  
Remove any sediment before it has accumulated to one-half of the above-ground height of any perimeter control.
- Responsible Staff: Construction Manager and Site Contractor(s).



Perimeter Control # 3

- BMP Description: Super Silt Fence.
- Installation Schedule: Prior to the Start of Construction.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.  
Remove any sediment before it has accumulated to one-half of the above-ground height of any perimeter control.
- Responsible Staff: Construction Manager and Site Contractor(s).

Perimeter Control # 4

- BMP Description: Wattles.
- Installation Schedule: Prior to the Start of Construction.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.  
Remove any sediment before it has accumulated to one-half of the above-ground height of any perimeter control.
- Responsible Staff: Construction Manager and Site Contractor(s).

Perimeter Control # 5

- BMP Description: Silt Fence with Straw Bales.
- Installation Schedule: Prior to the Start of Construction and/or immediately after stockpile is established.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.  
Remove any sediment before it has accumulated to one-half of the above-ground height of any perimeter control.
- Responsible Staff: Construction Manager and Site Contractor(s).

### **4.3 Sediment Track-Out**

#### **General**

Gates will be located as shown on the Erosion and Sedimentation Control Plan in Attachment A to allow for construction vehicle access. Construction access points will have a stabilized construction entrance station or wheel wash station to minimize the track-out of sediment onto off-site streets, other paved areas, and sidewalks from vehicles exiting the construction site. Where sediment has been tracked out from your site onto paved roads, sidewalks, or other paved areas outside of your site, remove the deposited sediment by the end of the same business day in which the track-out occurs or by the end of the next business day if track-out occurs on a non-business day. Remove the track-out by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. You are prohibited from hosing or sweeping tracked out sediment into any stormwater conveyance, storm drain inlet, or water of the U.S.

#### **Specific Track-Out Controls**

Track-Out Control # 1

- BMP Description: Street Sweeping.
- Installation Schedule: Start of construction.

- Inspection Schedule: The areas adjacent to the site should be inspected daily to determine if street sweeping is required.
- Responsible Staff: Construction Manager and Site Contractor(s).

#### Track-Out Control # 2

- BMP Description: Stabilized Construction Entrance.
- Installation Schedule: Start of construction.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

#### Track-Out Control # 3

- BMP Description: Wheel Wash Station.
- Installation Schedule: Start of construction.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP(s).  
The operator must provide an effective means of minimizing the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other types of wash waters. The operator must ensure there is no discharge of soaps, solvents, or detergents in equipment and vehicle wash water. For storage of soaps, detergents, or solvents, the operator shall provide either a cover to minimize the exposure of these detergents to precipitation and to stormwater, or a similarly effective means designed to minimize discharge of pollutants from these areas.
- Responsible Staff: Construction Manager and Site Contractor.

### **4.4 Stockpiled Sediment or Soil**

#### **General**

All soil stockpiles will be located outside of any natural buffers and away from existing and proposed catch basins and area drains and outside of proposed infiltration system footprints. A sediment barrier shall be installed along all downgradient perimeter areas. Examples of sediment barriers include silt fence, super silt fence, or wattles.

You are prohibited from hosing down or sweeping soil or sediment accumulated on pavement or other impervious surfaces into any stormwater conveyance, storm drain inlet, or water of the U.S.

For stockpiles that will be unused for 14 or more days, a cover such as a tarp or blown straw shall be provided or temporary stabilization should be provided (consistent with Part 2.2.14 of the CGP).

#### **Specific Stockpile Controls**

##### Stockpile Control # 1

- BMP Description: Silt Fence.
- Installation Schedule: Immediately after stockpile is established.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.

- Responsible Staff:

Remove any sediment before it has accumulated to one-half of the above-ground height of any perimeter control.  
Construction Manager and Site Contractor(s).

#### Stockpile Control # 2

- BMP Description:
- Installation Schedule:
- Inspection Schedule:
- Maintenance:

Wattles.  
Immediately after stockpile is established.  
Once every 7 days and within 24 hours of a storm event 0.25" or greater.  
Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.  
Remove any sediment before it has accumulated to one-half of the above-ground height of any perimeter control.  
Construction Manager and Site Contractor(s).

#### Stockpile Control # 3

- BMP Description:
- Installation Schedule:
- Inspection Schedule:
- Maintenance:
- Responsible Staff:

Tarp.  
When stockpile will remain inactive for 14 or more calendar days.  
Once every 7 days and within 24 hours of a storm event 0.25" or greater.  
Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.  
Remove any sediment before it has accumulated to one-half of the above-ground height of any perimeter control.  
Construction Manager and Site Contractor(s).

#### Stockpile Control # 4

- BMP Description:
- Installation Schedule:
- Inspection Schedule:
- Maintenance:
- Responsible Staff:

Straw Bales.  
Immediately after stockpile is established.  
Once every 7 days and within 24 hours of a storm event 0.25" or greater.  
Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.  
Remove any sediment before it has accumulated to one-half of the above-ground height of any perimeter control.  
Construction Manager and Site Contractor(s).

#### Stockpile Control # 5

- BMP Description:
- Installation Schedule:
- Inspection Schedule:
- Maintenance:
- Responsible Staff:

Blown Straw.  
When stockpile will remain inactive for 14 or more calendar days.  
Once every 7 days and within 24 hours of a storm event 0.25" or greater.  
Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.  
Remove any sediment before it has accumulated to one-half of the above-ground height of any perimeter control.  
Construction Manager and Site Contractor(s).

#### Stockpile Control # 6

- BMP Description:
- Installation Schedule:

Hydroseeding.  
When stockpile will remain inactive for 14 or more calendar days.

- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.  
Remove any sediment before it has accumulated to one-half of the above-ground height of any perimeter control.
- Responsible Staff: Construction Manager and Site Contractor(s).

#### **4.5 Minimize Dust**

##### **General**

Disturbed land will be temporarily stabilized as required by the CGP. Dust will be minimized using measures including sprinkling/irrigation, vegetative cover, mulch, and/or stone. Stockpiles will be handled in accordance with section 4.4 of the SWPPP.

Earth-disturbing activities are considered temporarily ceased when work will not resume for a period of 14 or more calendar days. Stabilization shall be initiated when earth-disturbing activities are temporarily or permanently ceased. Stabilization activities shall be complete within 7 calendar days after the initiation of soil stabilization measures.

##### **Specific Dust Controls**

###### Dust Control # 1

- BMP Description: Sprinkling/Irrigation.
- Installation Schedule: As needed throughout earthwork activities as determined by the site contractor and construction manager.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

###### Dust Control # 2

- BMP Description: Straw or Mulch.
- Installation Schedule: As needed throughout earthwork activities as determined by the site contractor and construction manager. When disturbed land will remain inactive for 14 or more calendar days.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

#### **4.6 Minimize the Disturbance of Steep Slopes**

##### **General**

Steep slopes (defined as slopes of 15% or greater in grade) are expected to be disturbed onsite. Disturbances to steep slopes will be minimized by phasing disturbances to those areas and by using stabilization practices designed to be used on steep grades.

## Specific Steep Slope Controls

### Steep Slope Control # 1

- BMP Description: Straw or Mulch.
- Installation Schedule: When disturbed land will remain inactive for 14 or more calendar days.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

### Steep Slope Control # 2

- BMP Description: Hydroseeding.
- Installation Schedule: When disturbed land will remain inactive for 14 or more calendar days.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

### Steep Slope Control # 3

- BMP Description: Soil Stabilization Mats.
- Installation Schedule: When disturbed land will remain inactive for 14 or more calendar days.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

### Steep Slope Control # 4

- BMP Description: Rip-Rap.
- Installation Schedule: When disturbed land will remain inactive for 14 or more calendar days.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

## 4.7 **Preserve Native Topsoil**

Onsite native topsoil shall be preserved, unless infeasible. Preserving native topsoil is not required where the intended function of a specific area of the site dictates that the topsoil be disturbed or removed.

Stockpiling topsoil at off-site locations or transferring topsoil to other locations is an example of a way to preserve native topsoil.

The contractor shall perform construction sequencing such that earth materials are exposed for a minimum of time before they are covered, seeded, or otherwise stabilized.

#### **4.8 Minimize Soil Compaction**

##### **General**

In areas where infiltration practices will be installed or areas of the site where final vegetative stabilization will occur, soil compaction shall be minimized. This includes restricting vehicle access and equipment use.

Areas used for post-construction infiltration shall be constructed after all ground surfaces are fully stabilized when feasible. If proposed infiltration areas are constructed prior to the site being fully stabilized, additional erosion controls shall be installed. All stockpiled and material storage areas shall be located outside of the areas proposed for post-construction infiltration.

Areas of post-construction landscaping shall be constructed after all ground surface are fully stabilized. If proposed landscaped areas are constructed prior to the site being fully stabilized, additional erosion controls shall be installed. All soil stockpiles and material storage areas shall be located outside of the areas proposed for post-construction landscaping where feasible. Where this is not feasible, use techniques that rehabilitate and condition the soils as necessary to support vegetative growth prior to planting.

#### **4.9 Storm Drain Inlets**

##### **General**

All existing and proposed storm drain inlets affected by construction activities should be protected using an Inlet Sediment Filter as shown on the Erosion and Sedimentation Control Plan provided in Attachment A.

Clean or remove and replace the protection measures as sediment accumulates, the filter becomes clogged, and/or performance is compromised. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, remove the deposited sediment by the end of the same business day in which it is found or by the end of the following business day if removal by the same business day is not feasible.

##### **Specific Storm Drain Inlet Controls**

###### Storm Drain Inlet Control # 1

- |                          |  |
|--------------------------|--|
| • BMP Description:       | Inlet Sediment Filter.   |
| • Installation Schedule: | Prior to the Start of Construction.  |
| • Inspection Schedule:   | Once every 7 days and within 24 hours of a storm event 0.25" or greater.                                 |
| • Maintenance:           | Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP. |
| • Responsible Staff:     | Construction Manager and Site Contractor(s).   |

###### Storm Drain Inlet Control # 2

- |                          |  |
|--------------------------|--|
| • BMP Description:       | Inlet Protection with Gravel.  |
| • Installation Schedule: | Prior to the Start of Construction .   |
| • Inspection Schedule:   | Once every 7 days and within 24 hours of a storm event 0.25" or greater.                                 |
| • Maintenance:           | Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP. |
| • Responsible Staff:     | Construction Manager and Site Contractor(s).   |

###### Storm Drain Inlet Control # 3

- |                          |   |
|--------------------------|---|
| • BMP Description:       | Inlet Protection with Block and Gravel. |
| • Installation Schedule: | Prior to the Start of Construction.     |

- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

#### **4.10 Minimize Erosion of Stormwater Conveyances**

The contractor shall minimize erosion of stormwater conveyance channels and their embankments, outlets, adjacent streambanks, slopes, and downstream waters. The contractor shall install erosion controls and velocity dissipation devices within and along the length of any stormwater conveyance channel and at any outlet to slow down runoff to minimize erosion.

##### Stormwater Conveyance Control # 1

- BMP Description: Check Dam.
- Installation Schedule: Start of construction of stormwater conveyance channel.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

##### Stormwater Conveyance Control # 2

- BMP Description: Sediment Trap.
- Installation Schedule: Start of construction of stormwater conveyance channel.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

##### Stormwater Conveyance Control # 3

- BMP Description: Rip Rap.
- Installation Schedule: Start of construction of stormwater conveyance channel.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

##### Stormwater Conveyance Control # 4

- BMP Description: Grouted Rip Rap at outlets.
- Installation Schedule: Start of construction of stormwater conveyance channel.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).



#### **4.11 Sediment Basins**

All sediment basins should be located outside of any waterbody, resource area, and buffer zones. Sediment basins shall be sized to provide storage for either the volume of runoff from a 2-year, 24-hour storm or 3,600 cubic feet per acre drained.

Where feasible, outlet structures that withdraw water from the surface of the sediment basin shall be used. Erosion and velocity dissipation devices shall be installed at inlets and outlets to prevent erosion.

Accumulated sediment shall be removed to maintain at least one-half of the design capacity. The basin shall be maintained so that it remains in effective operating condition.

##### Sediment Basin Control # 1

- BMP Description: Check Dam.
- Installation Schedule: Start of construction of stormwater conveyance channel.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

##### Sediment Basin Control # 2

- BMP Description: Sediment Trap.
- Installation Schedule: Start of construction of stormwater conveyance channel.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s)

##### Sediment Basin Control # 3

- BMP Description: Rip Rap.
- Installation Schedule: Start of construction of stormwater conveyance channel.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

##### Sediment Basin Control # 4

- BMP Description: Grouted Rip Rap at outlets.
- Installation Schedule: Start of construction of stormwater conveyance channel.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).



#### **4.12 Chemical Treatment**

There are no proposed chemical treatments associated with this project.

#### **4.13 Dewatering Practices**

Dewatering will occur in a way that minimizes the discharge of pollutants in ground water or accumulated stormwater that is removed from excavations, trenches, foundations, vaults, or other similar points of accumulation. Dewatering water shall be treated in compliance with Section 2.4 of the CGP and water with visible floating solids or foam may not be discharged.

Any applicable permits shall be obtained from local permitting authorities.

##### Dewatering Control # 1

- BMP Description: Sediment basin or Sediment Trap.
- Installation Schedule: Start of construction of stormwater conveyance channel.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

##### Dewatering Control # 2

- BMP Description: Sediment socks.
- Installation Schedule: Start of construction of stormwater conveyance channel.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

##### Dewatering Control # 3

- BMP Description: Dewatering Tanks.
- Installation Schedule: Start of construction of stormwater conveyance channel.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater and as required by the manufacturer.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

##### Dewatering Control # 4

- BMP Description: Filtration Systems.
- Installation Schedule: Start of construction of stormwater conveyance channel.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater and as required by the manufacturer.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

#### 4.14 Other Stormwater Controls

Any changes in construction activity that include means of stormwater control not included in this document will be identified, the SWPPP will be amended, and the appropriate erosion and sedimentation controls will be implemented.

#### 4.15 Site Stabilization

Initiate the installation of stabilization measures immediately in any areas of exposed soil where construction activities have permanently ceased or will be temporarily inactive for 14 or more calendar days. Complete the installation of stabilization measures as soon as practicable, but no later than 7 calendar days after stabilization has been initiated.

##### Site Stabilization Practice #1

☐ Vegetative    ☒ Non-Vegetative  
☒ Temporary    ☐ Permanent

- BMP Description: Soil Stabilization Mat.
- Installation Schedule: As/if required.
- Maintenance and Inspection: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Responsible Staff: Construction Manager and Site Contractor(s).

##### Site Stabilization Practice #2

☒ Vegetative    ☐ Non-Vegetative  
☒ Temporary    ☐ Permanent

- BMP Description: Temporary Seeding.
- Installation Schedule: As/if required.
- Maintenance and Inspection: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Responsible Staff: Construction Manager and Site Contractor(s).

## **SECTION 5: POLLUTION PREVENTION STANDARDS**

### **5.1 *Potential Sources of Pollution***

Potential sources of sediment to stormwater runoff:

- Stockpiles and construction staging
- Clearing and grubbing operations
- Grading and site excavation
- Topsoil stripping
- Landscape operations
- Soil tracking offsite from construction vehicles
- Runoff from unstabilized areas
- Construction debris

Potential pollutants and sources, other than sediment, to stormwater runoff:

- Combined Staging Area – fueling activities, equipment maintenance, sanitary facilities, and hazardous waste storage
- Materials Storage Area – building materials, solvents, adhesives, paving materials, paints, aggregates, trash, etc.
- Construction Activity-paving, curb installation, concrete pouring, and building construction

Staging areas are shown on the Erosion and Sedimentation Control Plan provided in Attachment A.

### Construction Site Pollutants

| <b>Pollutant-Generating Activity</b>                            | <b>Pollutants or Pollutant Constituents<br/>(that could be discharged if exposed to stormwater)</b> | <b>Location on Site<br/>(or reference SWPPP site map where this is shown)</b> |
|---|---|---|
| Pesticides (insecticides, fungicides, herbicides, rodenticides) | Chlorinated hydrocarbons, organophosphates, carbonates, arsenic                                     | Herbicides used for noxious weed control                                      |
| Fertilizers   | Nitrogen, phosphorous   | Newly seeded areas  |
| Plaster   | Calcium sulphate, calcium carbonate, sulfuric acid  | Building construction   |
| Cleaning Solvents   | Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates                     | No equipment cleaning allowed in project limits                               |
| Asphalt   | Oil, petroleum distillates  | Streets and parking lots  |
| Concrete  | Limestone, sand pH, chromium  | Curb and gutter, sidewalk, building construction                              |
| Glue, Adhesives   | Polymers, epoxies   | Building construction   |
| Paints  | Metal oxides, Stoddard solvent, talc, calcium carbonate, arsenic                                    | Building construction   |
| Curing compounds  | Naphtha   | Curb and gutter, building construction  |
| Wood preservatives  | Stoddard solvent, petroleum distillates, arsenic, copper, chromium                                  | Timber pads, bracing, building construction                                   |
| Hydraulic Oils/fluids   | Mineral oil   | Leaks/broken hoses from equipment   |
| Gasoline  | Benzene, ethyl benzene, toluene, xylene, MTBE   | Secondary containment/staging area  |
| Diesel Fuel   | Petroleum distillate, oil & grease, naphthalene, xylenes  | Secondary containment/staging area  |
| Kerosene  | Coal oil, petroleum distillates   | Secondary containment/staging area  |
| Antifreeze/coolant  | Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)                                | Leaks or broken hoses from equipment  |
| Sanitary toilets  | Bacteria, parasites, and viruses  | Staging area  |

## **5.2 Spill Prevention and Response**

### **BMP Description: Spill kit, vehicle washing, silt sack catch basin protection, silt fence**

Installation Schedule: Start of construction activity

Maintenance and Inspection: Minimum weekly & as necessary

Responsible Staff: Construction Manager and Site Contractor

- Major vehicle maintenance onsite is prohibited
- Re-fueling of vehicles within 25 feet of a drainage structure is prohibited
- Spill kit shall be kept onsite consisting of:
  - Gloves
  - Absorbent mats
  - Drip pan

### **Spill Prevention and Control Plan**

- Refer to contractor's Spill Plan.
- Manufacturers' recommended spill control methods will be posted onsite and site personnel will be made aware of the requirements.
- Cleanup supplies will be kept onsite in a materials storage area. This equipment will include: goggles, brooms, dustpans, mops, rags, gloves, oil absorbent, sawdust, plastic and metal trash cans, and other materials and supplies specifically designated for cleanup.
- All spills will be immediately cleaned up after discovery.
- The spill area will be well ventilated.
- Cleanup personnel will wear suitable protective clothing.
- Spills of toxic and/or hazardous material will be reported to state, local, and Federal authorities, as required by law. Spills shall also be reported immediately to the owner.
- A spill incident report will be filed detailing the amount and extent of the spill, material(s) involved, and effectiveness of the cleanup. This report will be on file at the Construction Manager/Site Contractor office, as well as kept onsite in the field office. A copy shall also be filed with the Hazard Communication Coordinator (HCC).

The Construction Manager/Site Contractor will designate someone onsite that will serve as the Spill Cleanup Coordinator. At least two other personnel will be designated as alternate spill coordinators. All spill control personnel will be trained in spill prevention, control, and cleanup. The names of the responsible personnel will be posted at the jobsite office of the Construction Manager/ Site Contractor.

## **5.3 Fueling and Maintenance of Equipment or Vehicles**

### **General**

Minor vehicle and equipment emergency maintenance can be performed onsite away from drainage structures. Major vehicle and equipment maintenance must be performed offsite. Equipment/vehicle storage areas and any onsite fuel tanks will be inspected weekly and after storm events. Equipment and vehicles will be inspected for leaks, equipment damage, and other service problems on each day of use. Any leaks will be repaired immediately or the equipment/vehicle will be removed from the site.

Minor vehicle and equipment emergency maintenance shall occur when a vehicle cannot be safely removed from the site. The vehicle should be repaired so it can be taken off-site so that the rest of the maintenance can occur.

Major vehicle maintenance onsite is prohibited. Re-fueling or maintenance of vehicles within 25 feet of a drainage structure shall be prohibited. Drip pans, drip cloths, or absorbent pads should be used when replacing spent fluids. The fluids should be collect and stored prior to being disposed of offsite.

### **Specific Pollution Prevention Practice #1**

- BMP Description: Spill Kit.
- Installation Schedule: Onsite throughout construction.
- Responsible Staff: Construction Manager and Site Contractor.

**Specific Pollution Prevention Practice #1**

- BMP Description: Drip Pans, Drip Cloths, Absorbent Pads.
- Installation Schedule: Onsite throughout construction.
- Responsible Staff: Construction Manager and Site Contractor.

**5.4 Washing of Equipment and Vehicles**

**General**

Vehicle and equipment washout areas shall be constructed by the contractor so that no untreated water enters the storm drain system. Soaps, detergents, or solvents must be stored in a way to prevent these detergents from coming into contact with rainwater, or a similarly effective means designed to prevent the discharge of pollutants from these areas.

**Specific Pollution Prevention Practices**

**Pollution Prevention Practice # 1**

- BMP Description: Designated vehicle/equipment washing areas
- Installation Schedule: Start of construction.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Responsible Staff: Construction Manager and Site Contractor

**Pollution Prevention Practice # 2**

- BMP Description: Spill kit, vehicle washing, straw bale catch basin protection, silt fence
- Installation Schedule: Start of construction activity
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Responsible Staff: Construction Manager and Site Contractor

**5.5 Storage, Handling, and Disposal of Construction Products, Materials, and Wastes**

**5.5.1 Building Products**

**General**

The contractor will recycle all construction materials possible. For materials that cannot be recycled, solid waste will be disposed of in accordance with DEP Regulations for Solid Waste Facilities, 310 CMR 10.00.

Any building materials required to be stored onsite will be stored at a combined staging and materials storage area as shown on the CMP. Larger items will be elevated by appropriate methods to minimize contact with runoff. The storage area will be inspected weekly and after storm events. It will be kept clean, organized, and equipped with appropriate cleaning supplies.

Building product usage shall follow the following good housekeeping BMPs:

- The Responsible Staff: Construction Manager or Site Contractor representative will inspect daily for inspection of the work area to ensure proper management of waste materials.
- Store only enough material onsite required for that job as to satisfy current construction needs.
- Store required materials in tightly lidded containers under cover.
- Store materials in original containers with clearly legible labels.
- Separate and store materials apart from each other.
- Do not mix materials unless specifically in accordance with manufacturers' recommendations.
- Use all products from a container before disposing of the container.
- Follow manufacturers' instructions for handling, storage, and disposing of all materials.
- All materials shall be stored in an area to prevent the discharge of pollutants from building products.

### **Specific Pollution Prevention Practices**

#### **Pollution Prevention Practice # 1**

- BMP Description: Perimeter Protection control around Stockpiles.
- Installation Schedule: Start of construction/ Immediately after stockpile is established.
- Inspection Schedule: Once every 7 days and within 24 hours of a storm event 0.25" or greater.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP. Remove any sediment before it has accumulated to one-half of the above-ground height of any perimeter control.
- Responsible Staff: Construction Manager and Site Contractor(s).

### **5.5.2 Pesticides, Herbicides, Insecticides, Fertilizers, and Landscape Materials**

- In storage areas, provide either (1) cover to minimize the exposure of these chemicals to precipitation and to stormwater or (2) a similarly effective means designed to minimize the discharge of pollutants from these areas.
- Comply with all application and disposal requirements included on the registered pesticide, herbicide, insecticide, and fertilizer label.

### **5.5.3 Diesel Fuel, Oil, Hydraulic Fluids, Other Petroleum Products, and Other Chemicals**

#### **General**

- Only skilled personnel in a designated area will perform fueling of vehicles onsite.
- Vehicles used onsite will be monitored for fuel and oil leaks.
- Vehicles used onsite will be maintained in good working order.
- Asphalt substances will be applied in accordance with manufacturers' recommendations.
- The use of petroleum products as a release agent for asphalt transport trucks is prohibited.
- Vehicle fueling will only be done in vehicle fueling areas located by the contractor. See section 5.3 of the SWPPP.
- The contractor shall be responsible for locating the fuel storage and re-fueling area onsite to minimize disturbance to construction activities and site area.
- Construction equipment not in active use for 5 minutes or more will be turned off.

### **5.5.4 Hazardous or Toxic Waste**

(Note: Examples include paints, solvents, petroleum-based products, wood preservatives, additives, curing compounds, acids.)

### **General**

- Keep products in their original containers.
- Original container labels should be clearly visible.
- Material safety data sheets will be kept onsite and be available.
- Follow all state, local, and Federal regulations regarding the handling, use, storage, and disposal of hazardous material.

#### **Paints:**

- All paint containers will be tightly sealed when not in use.
- Remove excess paint in original labeled containers from the jobsite.
- Paint will not be disposed of onsite. Remove excess paint material from the site and legally dispose of.
- Paint shall not be disposed of in the storm drain system.



### **5.5.5 Construction and Domestic Waste**

#### **General**

The contractor will manage domestic waste onsite. The contractor will provide waste containers of sufficient size and number to contain construction and domestic wastes. The waste container lids will be kept closed when not in use and lids will be closed at the end of the business day for those containers that are actively used throughout the day. For waste containers that do not have lids, provide either a cover or a similarly effective means designed to minimize discharge of pollutants. Clean up immediately if containers overflow.

#### **Pollution Prevention Practice # 1**

- BMP Description: Dumpster.
- Installation Schedule: Start of construction.
- Maintenance and Inspection: Weekly and covered daily.
- Responsible Staff: Construction Manager and Site Contractor(s).

#### **Pollution Prevention Practice # 2**

- BMP Description: Litter/debris pick-up.
- Installation Schedule: Start of construction.
- Maintenance and Inspection: Daily.
- Responsible Staff: Construction Manager and Site Contractor(s).

### **5.5.6 Sanitary Waste**

All sanitary waste portable toilets shall be positioned so that they are secure and will not be tipped or knocked over, and located away from any stormwater inlets or conveyances.

#### **Pollution Prevention Practice # 1**

- BMP Description: Porta John.
- Installation Schedule: Start of construction.
- Maintenance and Inspection: As manufacturer requires.
- Responsible Staff: Construction Manager and Site Contractor(s).

### **5.6 Washing of Applicators and Containers used for Paint, Concrete, or Other Materials**

#### **General**

Washing of applicators and containers used for paint, concrete, or other materials shall follow the following good housekeeping BMPs:

- An effective means of eliminating the discharge of water from the washout and cleanout of stucco, paint, concrete, form release oils, curing compounds, and other construction materials.
- All washwater must be directed into a leak-proof container or leak-proof pit. The container or pit must be designed so that no overflows can occur due to inadequate sizing or precipitation.
- Washout and cleanout wastes should be handled as follows:
  - Do not dump liquid wastes into storm sewers.
  - Dispose of liquid wastes in accordance with applicable requirements.
  - Remove and dispose of hardened concrete waste consistent with the handling of other construction wastes.
- Locate any washout or cleanout activities as far away as possible from surface waters and stormwater inlets or conveyances, and to the extent practicable, designate areas to be used for these activities and conduct such activities only in these areas.

**Pollution Prevention Practice # 1**

- BMP Description: Designated applicator and container washing areas.
- Installation Schedule: Start of construction.
- Maintenance and Inspection: Daily.
- Responsible Staff: Construction Manager and Site Contractor(s).

**5.7 Fertilizers**

**General**

If fertilizer is required onsite, installation will follow the following guidelines:

- Fertilizers will be used at the application rates called for in the specifications for the project.
- Once applied, fertilizer will be worked into the soil to minimize wash off from irrigation and stormwater.
- Fertilizer will be stored under cover.
- The contents of partially used fertilizer bags will be transferred to re-sealable, watertight containers clearly labeled with their contents.
- Avoid applying before heavy rains.
- Never apply to frozen ground.
- Never apply to stormwater conveyance channels with flowing water.

**5.8 Other Pollution Prevention Practices**

Any changes in construction activity that produce other allowable non-stormwater discharges will be identified, the SWPPP will be amended and the appropriate erosion and sedimentation controls will be implemented.

**Control # X**

- BMP Description: Description of control to be installed.
- Installation Schedule: Approximate date of installation.
- Inspection Schedule: Pick Inspection schedule from above.
- Maintenance: Ensure that all stormwater controls remain in effective condition as described in part 2.1.4 of the CGP.
- Responsible Staff: Construction Manager and Site Contractor(s).

## SECTION 6: INSPECTION AND CORRECTIVE ACTION

### 6.1 *Inspection Personnel and Procedures*

#### Personnel Responsible for Inspections

Construction Manager  
Contact Person

Site Contractor  
Contact person

(Note: All personnel conducting inspections must be considered a “qualified person.” CGP Part 4.1.1 clarifies that a “qualified person” is a person knowledgeable in the principles and practices of erosion and sediment controls and pollution prevention, who possesses the skills to assess conditions at the construction site that could impact stormwater quality, and the skills to assess the effectiveness of any stormwater controls selected and installed to meet the requirements of this permit.)

#### Inspection Schedule

##### Specific Inspection Frequency

The contractor shall inspect and maintain erosion control measures, and remove sediment therefrom, once every 7 days and within 24 hours of a storm event 0.25” or greater

##### Rain Gauge Location:

NOAA Rain Gauge Location or Onsite Rain Gauge Location

##### Reductions in Inspection Frequency (if applicable):

Inspection frequency may be reduced to twice per month (no more than 14 days apart) for the first month in areas of the site where the stabilization steps outlined in Parts 2.2.14 of the CGP have been completed. After the first month, inspection frequency may be reduced to once per month. If construction activity resumes in this portion of the site at a later date, the inspection frequency immediately increases to that required in Parts 4.2 and 4.3 as applicable. You must document the beginning and ending dates of this period in the SWPPP.

Inspection frequency may be reduced to once per month and within 24 hours of the occurrence of a storm event of 0.25 inches or greater if the project is located in an arid, semi-arid, or drought-stricken area and construction is occurring during the seasonally dry period or a period in which drought is predicted to occur. If this inspection frequency is followed, you must document the beginning and ending dates of this period in the SWPPP.

Inspections can be temporarily suspended under the following conditions:

- Earth-disturbing activity is suspended due to frozen condition;
- Runoff is unlikely due to continuous frozen conditions that are likely to continue at the site for at least three months based on historic seasonal averaged. **If unexpected weather conditions make discharges likely, the operators must immediately resume the regular inspection schedule;**
- Land disturbances have been suspended; and
- All disturbed areas of the site have been stabilized in accordance with Part 2.2.14a of the CGP.

Inspection frequency may be reduced to once per month under the following conditions:

- The operator is still conducting earth disturbing activities under frozen conditions;
- Runoff is unlikely due to continuous frozen conditions that are likely to continue at the site for at least three months based on historic seasonal averages. **If unexpected weather conditions make discharges likely, the operator must immediately resume the regular inspection schedule;** and
- Except for areas in which the operator is conducting earth-disturbing activities, disturbed areas of the site have been stabilized in accordance with Part 2.2.14a of the CGP.

### **Inspection Report Forms**

Copies of inspection reports are in Attachment D.

## **6.2 Corrective Action**

### **Personnel Responsible for Corrective Actions**

Contact Person, Construction Manager Company

Contact Person, Site Contractor

### **Corrective Action Forms**

A copy of the Corrective Action Form is in Attachment E.

## **6.3 Delegation of Authority**

### **Duly Authorized Representative(s) or Position(s):**

Construction Manager Company

Contact Person

Contact Person Title

Street Address

Town/City, State Zip Code

xxx-xxx-xxxx

Email address

## SECTION 7: TRAINING LOG

Refer to Attachment I for a Training Log to be completed for each SWPPP training session.

**Table 7-1: Documentation for Completion of Training**

| Name | Date Training Completed |
|------|-------------------------|
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## SECTION 8: CERTIFICATION AND NOTIFICATION

### **Operator – Owner's Representative**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

### **Operator – Construction Manager**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## **SWPPP ATTACHMENTS**

Attach the following documentation to the SWPPP:

*Attachment A – Site Maps*

*Attachment B – 2017 Construction General Permit*

*Attachment C – NOI and EPA Authorization Email*

*Attachment D – Inspection Form*

*Attachment E – Corrective Action Form*

*Attachment F – SWPPP Amendment Log*

*Attachment G – Subcontractor Certifications/Agreements*

*Attachment H – Grading and Stabilization Activities Log*

*Attachment I – SWPPP Training Log*

*Attachment J – Delegation of Authority Form*

*Attachment K – Endangered Species Documentation*

*Attachment L – Historic Preservation Documentation*

*Attachment M – Rainfall Gauge*

*Attachment N – Order of Conditions*

## Attachment A – Site Maps

Site Maps must include the following:

- a) Boundaries of the property. The map(s) in the SWPPP must show the overall boundary of the property.
- b) Locations where construction activities will occur. The map(s) in the SWPPP must show the locations where construction activities will occur, including
  - i. Locations where earth-disturbing activities will occur (note any phasing), including any demolition activities;
  - ii. Approximate slopes before and after major grading activities (note any steep slopes);
  - iii. Locations where sediment, soil, or other construction materials will be stockpiled;
  - iv. Any water of the U.S. crossings;
  - v. Designated points where vehicles will exit onto paved roads;
  - vi. Locations of structures and other impervious surfaces upon completion of construction;
  - vii. Locations of onsite and off-site construction support activity areas covered by the permit (see Part 1.2.1.c).
- c) Locations of all waters of the U.S. within and one mile downstream of the site's discharge point. Also identify if any are listed as impaired, or are identified as a Tier 2, Tier 2.5, or Tier 3 water.
- d) Areas of federally listed critical habitats within the site and/or at discharge locations.
- e) Type and extent of pre-construction cover on the site (e.g., vegetative cover, forest, pasture, pavement, structures).
- f) Drainage patterns of stormwater and authorized non-stormwater before and after major grading activities.
- g) Stormwater and authorized non-stormwater discharge locations. The permit requires the site map to show information pertaining to discharge locations including:
  - i. Locations where stormwater and/or authorized non-stormwater will be discharges to storm drain inlets; and
  - ii. Locations where stormwater and/or authorized non-stormwater will be discharged directly to waters of the U.S.
- h) Locations of all potential pollutant-generating activities identified in Part 7.2.3.g. The permit requires identification in the site map of all potential pollutant-generating activities identified in Part 7.2.3.g.
- i) Locations of stormwater controls, including natural buffer areas and any shared controls utilized to comply with this permit. The permit requires identification on the site map of the location of stormwater control measures.
- j) Locations where polymers, flocculants, or other treatment chemicals will be used and stored. The permit requires identification on the site map of the locations where polymers, flocculants, or other treatment chemicals will be used and stored.

Include the following if possible:

- LOCUS Map created with GIS
- USGS Map created with GIS
- Phasing Plans/Mobilization Plans/Construction Management Plans from the contractor
- Erosion and Sedimentation Control Plans



**Attachment B – 2017 Construction General Permit**

**National Pollutant Discharge Elimination System  
General Permit for Discharges from  
Construction Activities**

In compliance with the provisions of the Clean Water Act, 33 U.S.C. §1251 et. seq., (hereafter CWA), as amended by the Water Quality Act of 1987, P.L. 100-4, "operators" of construction activities (defined in Appendix A) that meet the requirements of Part 1.1 of this National Pollutant Discharge Elimination System (NPDES) general permit, are authorized to discharge pollutants in accordance with the effluent limitations and conditions set forth herein. Permit coverage is required from the "commencement of construction activities" (see Appendix A) until one of the conditions for terminating CGP coverage has been met (see Part 8.2).

This permit becomes effective on **February 16, 2017**.

This permit and the authorization to discharge expire at 11:59pm, **February 16, 2022**.

Signed and issued this 11<sup>th</sup> day of January 2017

Deborah Szaro,  
Acting Regional Administrator, EPA Region 1

Signed and issued this 11<sup>th</sup> day of January 2017

William K. Honker, P.E.,  
Director, Water Division, EPA Region 6

Signed and issued this 11<sup>th</sup> day of January 2017

Javier Laureano, Ph.D.,  
Director, Clean Water Division, EPA Region 2

Signed and issued this 11<sup>th</sup> day of January 2017

Karen Flournoy,  
Director, Water, Wetlands, and Pesticides Division,  
EPA Region 7

Signed and issued this 11<sup>th</sup> day of January 2017

Jose C. Font,  
Acting Director, Caribbean Environmental  
Protection Division, EPA Region 2.

Signed and issued this 11<sup>th</sup> day of January 2017

Darcy O'Connor,  
Assistant Regional Administrator, Office of Water  
Protection, EPA Region 8

Signed and issued this 11<sup>th</sup> day of January 2017

Dominique Lueckenhoff,  
Acting Director, Water Protection Division, EPA  
Region 3

Signed and issued this 11<sup>th</sup> day of January 2017

Kristin Gullatt  
Deputy Director, Water Division, EPA Region 9

Signed and issued this 11<sup>th</sup> day of January 2017

César A. Zapata,  
Deputy Director, Water Protection Division, EPA  
Region 4

Signed and issued this 11<sup>th</sup> day of January 2017

Daniel D. Opalski,  
Director, Office of Water and Watersheds, EPA  
Region 10

Signed and issued this 11<sup>th</sup> day of January 2017

Christopher Korleski,  
Director, Water Division, EPA Region 5

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## **1 HOW TO OBTAIN COVERAGE UNDER THE CONSTRUCTION GENERAL PERMIT (CGP)**

To be covered under this permit, you must meet the eligibility conditions and follow the requirements for obtaining permit coverage in this Part.

### **1.1 ELIGIBILITY CONDITIONS**

- 1.1.1** You are an “operator” of a construction site for which discharges will be covered under this permit. For the purposes of this permit and in the context of stormwater discharges associated with construction activity, an “operator” is any party associated with a construction project that meets either of the following two criteria:
- a. The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications (*e.g., in most cases this is the owner of the site*); or
  - b. The party has day-to-day operational control of those activities at a project that are necessary to ensure compliance with the permit conditions (*e.g., they are authorized to direct workers at a site to carry out activities required by the permit; in most cases this is the general contractor (as defined in Appendix A) of the project*).

Where there are multiple operators associated with the same project, all operators must obtain permit coverage.<sup>1</sup> Subcontractors generally are not considered operators for the purposes of this permit.

- 1.1.2** Your site's construction activities:
- a. Will disturb one or more acres of land, or will disturb less than one acre of land but are part of a common plan of development or sale that will ultimately disturb one or more acres of land; or
  - b. Have been designated by EPA as needing permit coverage under 40 CFR 122.26(a)(1)(v) or 40 CFR 122.26(b)(15)(ii);
- 1.1.3** Your site is located in an area where EPA is the permitting authority (see Appendix B);
- 1.1.4** Discharges from your site are not:
- a. Already covered by a different NPDES permit for the same discharge; or
  - b. In the process of having coverage under a different NPDES permit for the same discharge denied, terminated, or revoked.<sup>2,3</sup>
- 1.1.5** You are able to demonstrate that you meet one of the criteria listed in Appendix D with respect to the protection of species that are federally listed as endangered or threatened under the Endangered Species Act (ESA) and federally designated critical habitat;

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<sup>1</sup> If the operator of a “construction support activity” (see Part 1.2.1c) is different than the operator of the main site, that operator must also obtain permit coverage. See Part 7.1 for clarification on the sharing of liability between and among operators on the same site and for conditions that apply to developing a SWPPP for multiple operators associated with the same site.

<sup>2</sup> Parts 1.1.4a and 1.1.4b do not include sites currently covered under the 2012 CGP that are in the process of obtaining coverage under this permit, nor sites covered under this permit that are transferring coverage to a different operator.

<sup>3</sup> Notwithstanding a site being made ineligible for coverage under this permit because it falls under the description of Parts 1.1.4a or 1.1.4b, above, EPA may waive the applicable eligibility requirement after specific review if it determines that coverage under this permit is appropriate.

- 1.1.6** You have completed the screening process in Appendix E relating to the protection of historic properties; and
- 1.1.7** You have complied with all requirements in Part 9 imposed by the applicable state, Indian tribe, or territory in which your construction activities and/or discharge will occur.
- 1.1.8** For “new sources” (as defined in Appendix A) only:
- a. EPA has not, prior to authorization under this permit, determined that discharges from your site will cause, have the reasonable potential to cause, or contribute to an excursion above any applicable water quality standard. Where such a determination is made prior to authorization, EPA may notify you that an individual permit application is necessary. However, EPA may authorize your coverage under this permit after you have included appropriate controls and implementation procedures designed to bring your discharge into compliance with this permit, specifically the requirement to meet water quality standards. In the absence of information demonstrating otherwise, EPA expects that compliance with the requirements of this permit, including the requirements applicable to such discharges in Part 3, will result in discharges that will not cause, have the reasonable potential to cause, or contribute to an excursion above any applicable water quality standard.
  - b. Discharges from your site to a Tier 2, Tier 2.5, or Tier 3 water<sup>4</sup> will not lower the water quality of the applicable water. In the absence of information demonstrating otherwise, EPA expects that compliance with the requirements of this permit, including the requirements applicable to such discharges in Part 3.2, will result in discharges that will not lower the water quality of such waters.
- 1.1.9** If you plan to add “cationic treatment chemicals” (as defined in Appendix A) to stormwater and/or authorized non-stormwater prior to discharge, you may not submit your Notice of Intent (NOI) unless and until you notify your applicable EPA Regional Office (see Appendix L) in advance and the EPA Regional Office authorizes coverage under this permit after you have included appropriate controls and implementation procedures designed to ensure that your use of cationic treatment chemicals will not lead to discharges that cause an exceedance of water quality standards.

## **1.2 TYPES OF DISCHARGES AUTHORIZED<sup>5</sup>**

- 1.2.1** The following stormwater discharges are authorized under this permit provided that appropriate stormwater controls are designed, installed, and maintained (see Parts 2 and 3):
- a. Stormwater discharges, including stormwater runoff, snowmelt runoff, and surface runoff and drainage, associated with construction activity under 40 CFR 122.26(b)(14) or 122.26(b)(15)(i);

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<sup>4</sup> Note: Your site will be considered to discharge to a Tier 2, Tier 2.5, or Tier 3 water if the first water to which you discharge is identified by a state, tribe, or EPA as a Tier 2, Tier 2.5, or Tier 3 water. For discharges that enter a storm sewer system prior to discharge, the first water of the U.S. to which you discharge is the waterbody that receives the stormwater discharge from the storm sewer system. See list of Tier 2, Tier 2.5, and Tier 3 waters in Appendix F.

<sup>5</sup> See “Discharge” as defined in Appendix A. Note: Any discharges not expressly authorized in this permit cannot become authorized or shielded from liability under CWA section 402(k) by disclosure to EPA, state, or local authorities after issuance of this permit via any means, including the Notice of Intent (NOI) to be covered by the permit, the SWPPP, or during an inspection.

- b. Stormwater discharges designated by EPA as needing a permit under 40 CFR 122.26(a)(1)(v) or 122.26(b)(15)(ii);
- c. Stormwater discharges from construction support activities (*e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas*) provided that:
  - i. The support activity is directly related to the construction site required to have permit coverage for stormwater discharges;
  - ii. The support activity is not a commercial operation, nor does it serve multiple unrelated construction sites;
  - iii. The support activity does not continue to operate beyond the completion of the construction activity at the site it supports; and
  - iv. Stormwater controls are implemented in accordance with Part 2 and Part 3 for discharges from the support activity areas.
- d. Stormwater discharges from earth-disturbing activities associated with the construction of staging areas and the construction of access roads conducted prior to active mining.

**1.2.2** The following non-stormwater discharges associated with your construction activity are authorized under this permit provided that, with the exception of water used to control dust and to irrigate vegetation in stabilized areas, these discharges are not routed to areas of exposed soil on your site and you comply with any applicable requirements for these discharges in Parts 2 and 3:

- a. Discharges from emergency fire-fighting activities;
- b. Fire hydrant flushings;
- c. Landscape irrigation;
- d. Water used to wash vehicles and equipment, provided that there is no discharge of soaps, solvents, or detergents used for such purposes;
- e. Water used to control dust;
- f. Potable water including uncontaminated water line flushings;
- g. External building washdown, provided soaps, solvents, and detergents are not used, and external surfaces do not contain hazardous substances (as defined in Appendix A) (*e.g., paint or caulk containing polychlorinated biphenyls (PCBs)*);
- h. Pavement wash waters, provided spills or leaks of toxic or hazardous substances have not occurred (unless all spill material has been removed) and where soaps, solvents, and detergents are not used. You are prohibited from directing pavement wash waters directly into any water of the U.S., storm drain inlet, or stormwater conveyance, unless the conveyance is connected to a sediment basin, sediment trap, or similarly effective control;
- i. Uncontaminated air conditioning or compressor condensate;
- j. Uncontaminated, non-turbid discharges of ground water or spring water;
- k. Foundation or footing drains where flows are not contaminated with process materials such as solvents or contaminated ground water; and
- l. Construction dewatering water discharged in accordance with Part 2.4.

- 1.2.3** Also authorized under this permit are discharges of stormwater listed above in Part 1.2.1, or authorized non-stormwater discharges listed above in Part 1.2.2, commingled with a discharge authorized by a different NPDES permit and/or a discharge that does not require NPDES permit authorization.

### **1.3 PROHIBITED DISCHARGES<sup>6</sup>**

- 1.3.1** Wastewater from washout of concrete, unless managed by an appropriate control as described in Part 2.3.4;
- 1.3.2** Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials;
- 1.3.3** Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance;
- 1.3.4** Soaps, solvents, or detergents used in vehicle and equipment washing or external building washdown; and
- 1.3.5** Toxic or hazardous substances from a spill or other release.

To prevent the above-listed prohibited non-stormwater discharges, operators must comply with the applicable pollution prevention requirements in Part 2.3.

### **1.4 SUBMITTING YOUR NOTICE OF INTENT (NOI)**

All "operators" (as defined in Appendix A) associated with your construction site, who meet the Part 1.1 eligibility requirements, and who seek coverage under this permit, must submit to EPA a complete and accurate NOI in accordance with the deadlines in **Table 1** prior to commencing construction activities.

**Exception:** If you are conducting construction activities in response to a public emergency (e.g., mud slides, earthquake, extreme flooding conditions, widespread disruption in essential public services), and the related work requires immediate authorization to avoid imminent endangerment to human health, public safety, or the environment, or to reestablish essential public services, you may discharge on the condition that a complete and accurate NOI is submitted within 30 calendar days after commencing construction activities (see Table 1) establishing that you are eligible for coverage under this permit. You must also provide documentation in your Stormwater Pollution Prevention Plan (SWPPP) to substantiate the occurrence of the public emergency.

#### **1.4.1 Prerequisite for Submitting Your NOI**

You must develop a SWPPP consistent with Part 7 before submitting your NOI for coverage under this permit.

#### **1.4.2 How to Submit Your NOI**

You must use EPA's NPDES eReporting Tool (NeT) to electronically prepare and submit your NOI for coverage under the 2017 CGP, unless you received a waiver from your EPA Regional Office.

To access NeT, go to <https://www.epa.gov/npdes/stormwater-discharges-construction-activities#ereporting>.

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<sup>6</sup> EPA includes these prohibited non-stormwater discharges here as a reminder to the operator that the only non-stormwater discharges authorized by this permit are at Part 1.2.2. Any unauthorized non-stormwater discharges must be covered under an individual permit or alternative general permit.



Waivers from electronic reporting may be granted based on one of the following conditions:

- a. If your operational headquarters is physically located in a geographic area (i.e., ZIP code or census tract) that is identified as under-served for broadband Internet access in the most recent report from the Federal Communications Commission; or
- b. If you have limitations regarding available computer access or computer capability.

If the EPA Regional Office grants you approval to use a paper NOI, and you elect to use it, you must complete the form in Appendix J.

### 1.4.3 Deadlines for Submitting Your NOI and Your Official Date of Permit Coverage

Table 1 provides the deadlines for submitting your NOI and the official start date of your permit coverage, which differ depending on when you commence construction activities.

**Table 1 NOI Submittal Deadlines and Official Start Date for Permit Coverage.**

| Type of Operator   | NOI Submittal Deadline <sup>7</sup>   | Permit Authorization Date <sup>8</sup>   |
|--|---|--|
| <b>Operator of a new site</b> (i.e., a site where construction activities commence on or after February 16, 2017)  | At least 14 calendar days before commencing construction activities.                        | 14 calendar days after EPA notifies you that it has received a complete NOI, unless EPA notifies you that your authorization is delayed or denied.   |
| <b>Operator of an existing site</b> (i.e., a site with 2012 CGP coverage where construction activities commenced prior to February 16, 2017)   | No later than <b>May 17, 2017</b> .   |  |
| <b>New operator of a permitted site</b> (i.e., an operator that through transfer of ownership and/or operation replaces the operator of an already permitted construction site that is either a "new site" or an "existing site")  | At least 14 calendar days before the date the transfer to the new operator will take place. |  |
| <b>Operator of an "emergency-related project"</b> (i.e., a project initiated in response to a public emergency (e.g., mud slides, earthquake, extreme flooding conditions, disruption in essential public services), for which the related work requires immediate authorization to avoid imminent endangerment to human health or the environment, or to reestablish essential public services) | No later than 30 calendar days after commencing construction activities.                    | You are considered provisionally covered under the terms and conditions of this permit immediately, and fully covered 14 calendar days after EPA notifies you that it has received a complete NOI, unless EPA notifies you that your authorization is delayed or denied. |

<sup>7</sup> If you miss the deadline to submit your NOI, any and all discharges from your construction activities will continue to be unauthorized under the CWA until they are covered by this or a different NPDES permit. EPA may take enforcement action for any unpermitted discharges that occur between the commencement of construction activities and discharge authorization.

<sup>8</sup> Discharges are not authorized if your NOI is incomplete or inaccurate or if you are not eligible for permit coverage.

#### 1.4.4 Modifying your NOI

If after submitting your NOI you need to correct or update any fields, you may do so by submitting a "Change NOI" form using NeT. Waivers from electronic reporting may be granted as specified in Part 1.4.1. If the EPA Regional Office has granted you approval to submit a paper NOI modification, you may indicate any NOI changes on the same NOI form in Appendix J.

When there is a change to the site's operator, the new operator must submit a new NOI, and the previous operator must submit a Notice of Termination (NOT) form as specified in Part 8.3.

#### 1.4.5 Your Official End Date of Permit Coverage

Once covered under this permit, your coverage will last until the date that:

- a. You terminate permit coverage consistent with Part 8; or
- b. You receive permit coverage under a different NPDES permit or a reissued or replacement version of this permit after expiring on February 16, 2022; or
- c. You fail to submit an NOI for coverage under a revised or replacement version of this permit before the deadline for existing construction sites where construction activities continue after this permit has expired.

### 1.5 REQUIREMENT TO POST A NOTICE OF YOUR PERMIT COVERAGE

You must post a sign or other notice of your permit coverage at a safe, publicly accessible location in close proximity to the construction site. The notice must be located so that it is visible from the public road that is nearest to the active part of the construction site, and it must use a font large enough to be readily viewed from a public right-of-way.<sup>9</sup> At a minimum, the notice must include:

- a. The NPDES ID (*i.e.*, *permit tracking number assigned to your NOI*);
- b. A contact name and phone number for obtaining additional construction site information;
- c. The Uniform Resource Locator (URL) for the SWPPP (if available), or the following statement: "If you would like to obtain a copy of the Stormwater Pollution Prevention Plan (SWPPP) for this site, contact the EPA Regional Office at *[include the appropriate CGP Regional Office contact information found at <https://www.epa.gov/npdes/contact-us-stormwater#regional>]*;" and
- d. The following statement "If you observe indicators of stormwater pollutants in the discharge or in the receiving waterbody, contact the EPA through the following website: <https://www.epa.gov/enforcement/report-environmental-violations>."

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<sup>9</sup> If the active part of the construction site is not visible from a public road, then place the notice of permit coverage in a position that is visible from the nearest public road and as close as possible to the construction site.

## **2 TECHNOLOGY-BASED EFFLUENT LIMITATIONS**

You must comply with the following technology-based effluent limitations in this Part for all authorized discharges.<sup>10</sup>

### **2.1 GENERAL STORMWATER CONTROL DESIGN, INSTALLATION, AND MAINTENANCE REQUIREMENTS**

You must design, install, and maintain stormwater controls required in Parts 2.2 and 2.3 to minimize the discharge of pollutants in stormwater from construction activities. To meet this requirement, you must:

#### **2.1.1 Account for the following factors in designing your stormwater controls:**

- a. The expected amount, frequency, intensity, and duration of precipitation;
- b. The nature of stormwater runoff and run-on at the site, including factors such as expected flow from impervious surfaces, slopes, and site drainage features. You must design stormwater controls to control stormwater volume, velocity, and peak flow rates to minimize discharges of pollutants in stormwater and to minimize channel and streambank erosion and scour in the immediate vicinity of discharge points; and
- c. The soil type and range of soil particle sizes expected to be present on the site.

#### **2.1.2 Design and install all stormwater controls in accordance with good engineering practices, including applicable design specifications.<sup>11</sup>**

#### **2.1.3 Complete installation of stormwater controls by the time each phase of construction activities has begun.**

- a. By the time construction activity in any given portion of the site begins, install and make operational any downgradient sediment controls (*e.g., buffers, perimeter controls, exit point controls, storm drain inlet protection*) that control discharges from the initial site clearing, grading, excavating, and other earth-disturbing activities.<sup>12</sup>
- b. Following the installation of these initial controls, install and make operational all stormwater controls needed to control discharges prior to subsequent earth-disturbing activities.

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<sup>10</sup> For each of the effluent limits in Part 2, as applicable to your site, you must include in your SWPPP (1) a description of the specific control(s) to be implemented to meet the effluent limit; (2) any applicable design specifications; (3) routine maintenance specifications; and (4) the projected schedule for its (their) installation/implementation. See Part 7.2.6.

<sup>11</sup> Design specifications may be found in manufacturer specifications and/or in applicable erosion and sediment control manuals or ordinances. Any departures from such specifications must reflect good engineering practices and must be explained in your SWPPP. You must also comply with any additional design and installation requirements specified for the effluent limits in Parts 2.2 and 2.3.

<sup>12</sup> Note that the requirement to install stormwater controls prior to each phase of construction activities for the site does not apply to the earth disturbance associated with the actual installation of these controls. Operators should take all reasonable actions to minimize the discharges of pollutants during the installation of stormwater controls.

**2.1.4 Ensure that all stormwater controls are maintained and remain in effective operating condition during permit coverage and are protected from activities that would reduce their effectiveness.**

- a. Comply with any specific maintenance requirements for the stormwater controls listed in this permit, as well as any recommended by the manufacturer.<sup>13</sup>
- b. If at any time you find that a stormwater control needs routine maintenance, you must immediately initiate the needed maintenance work, and complete such work by the close of the next business day.
- c. If at any time you find that a stormwater control needs repair or replacement, you must comply with the corrective action requirements in Part 5.

**2.2 EROSION AND SEDIMENT CONTROL REQUIREMENTS**

You must implement erosion and sediment controls in accordance with the following requirements to minimize the discharge of pollutants in stormwater from construction activities.

**2.2.1 Provide and maintain natural buffers and/or equivalent erosion and sediment controls when a water of the U.S. is located within 50 feet of the site's earth disturbances.**

- a. **Compliance Alternatives.** For any discharges to waters of the U.S. located within 50 feet of your site's earth disturbances, you must comply with one of the following alternatives:
  - i. Provide and maintain a 50-foot undisturbed natural buffer; or
  - ii. Provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by erosion and sediment controls that achieve, in combination, the sediment load reduction equivalent to a 50-foot undisturbed natural buffer; or
  - iii. If infeasible to provide and maintain an undisturbed natural buffer of any size, implement erosion and sediment controls to achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.

See Appendix G, Part G.2 for additional conditions applicable to each compliance alternative.

- b. **Exceptions.** See Appendix G, Part G.2 for exceptions to the compliance alternatives.

**2.2.2 Direct stormwater to vegetated areas and maximize stormwater infiltration and filtering to reduce pollutant discharges, unless infeasible.**

**2.2.3 Install sediment controls along any perimeter areas of the site that will receive pollutant discharges.<sup>14</sup>**

- a. Remove sediment before it has accumulated to one-half of the above-ground height of any perimeter control.
- b. **Exception.** For areas at "linear construction sites" (as defined in Appendix A) where perimeter controls are infeasible (*e.g., due to a limited or restricted right-of-way*),

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<sup>13</sup> Any departures from such maintenance recommendations made by the manufacturer must reflect good engineering practices and must be explained in your SWPPP.

<sup>14</sup> Examples of perimeter controls include filter berms, silt fences, vegetative strips, and temporary diversion dikes.

implement other practices as necessary to minimize pollutant discharges to perimeter areas of the site.

#### **2.2.4 Minimize sediment track-out.**

- a. **Restrict vehicle use to properly designated exit points;**
- b. Use appropriate stabilization techniques<sup>15</sup> at all points that exit onto paved roads.
  - i. **Exception:** Stabilization is not required for exit points at linear utility construction sites that are used only episodically and for very short durations over the life of the project, provided other exit point controls<sup>16</sup> are implemented to minimize sediment track-out;
- c. Implement additional track-out controls<sup>17</sup> as necessary to ensure that sediment removal occurs prior to vehicle exit; and
- d. Where sediment has been tracked-out from your site onto paved roads, sidewalks, or other paved areas outside of your site, remove the deposited sediment by the end of the same business day in which the track-out occurs or by the end of the next business day if track-out occurs on a non-business day. Remove the track-out by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. You are prohibited from hosing or sweeping tracked-out sediment into any stormwater conveyance, storm drain inlet, or water of the U.S.<sup>18</sup>

#### **2.2.5 Manage stockpiles or land clearing debris piles composed, in whole or in part, of sediment and/or soil:**

- a. Locate the piles outside of any natural buffers established under Part 2.2.1 and away from any stormwater conveyances, drain inlets, and areas where stormwater flow is concentrated;
- b. Install a sediment barrier along all downgradient perimeter areas;<sup>19</sup>
- c. For piles that will be unused for 14 or more days, provide cover<sup>20</sup> or appropriate temporary stabilization (consistent with Part 2.2.14);
- d. You are prohibited from hosing down or sweeping soil or sediment accumulated on pavement or other impervious surfaces into any stormwater conveyance, storm drain inlet, or water of the U.S.

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<sup>15</sup> Examples of appropriate stabilization techniques include the use of aggregate stone with an underlying geotextile or non-woven filter fabric, and turf mats.

<sup>16</sup> Examples of other exit point controls include preventing the use of exit points during wet periods; minimizing exit point use by keeping vehicles on site to the extent possible; limiting exit point size to the width needed for vehicle and equipment usage; using scarifying and compaction techniques on the soil; and avoiding establishing exit points in environmentally sensitive areas (e.g., karst areas; steep slopes).

<sup>17</sup> Examples of additional track-out controls include the use of wheel washing, rumble strips, and rattle plates.

<sup>18</sup> Fine grains that remain visible (i.e., staining) on the surfaces of off-site streets, other paved areas, and sidewalks after you have implemented sediment removal practices are not a violation of Part 2.2.4.

<sup>19</sup> Examples of sediment barriers include berms, dikes, fiber rolls, silt fences, sandbags, gravel bags, or straw bale.

<sup>20</sup> Examples of cover include tarps, blown straw and hydroseeding.

**2.2.6 Minimize dust.** On areas of exposed soil, minimize the generation of dust through the appropriate application of water or other dust suppression techniques.

**2.2.7 Minimize steep slope disturbances.** Minimize the disturbance of "steep slopes" (as defined in Appendix A).

**2.2.8 Preserve native topsoil, unless infeasible.**<sup>21</sup>

**2.2.9 Minimize soil compaction.**<sup>22</sup> In areas of your site where final vegetative stabilization will occur or where infiltration practices will be installed:

- a. Restrict vehicle and equipment use in these locations to avoid soil compaction; and
- b. Before seeding or planting areas of exposed soil that have been compacted, use techniques that rehabilitate and condition the soils as necessary to support vegetative growth.

**2.2.10 Protect storm drain inlets.**

- a. Install inlet protection measures that remove sediment from discharges prior to entry into any storm drain inlet that carries stormwater flow from your site to a water of the U.S., provided you have authority to access the storm drain inlet;<sup>23</sup> and
- b. Clean, or remove and replace, the protection measures as sediment accumulates, the filter becomes clogged, and/or performance is compromised. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, remove the deposited sediment by the end of the same business day in which it is found or by the end of the following business day if removal by the same business day is not feasible.

**2.2.11 Minimize erosion of stormwater conveyance channels and their embankments, outlets, adjacent streambanks, slopes, and downstream waters.** Use erosion controls and velocity dissipation devices<sup>24</sup> within and along the length of any stormwater conveyance channel and at any outlet to slow down runoff to minimize erosion.

**2.2.12 If you install a sediment basin or similar impoundment:**

- a. Situate the basin or impoundment outside of any water of the U.S. and any natural buffers established under Part 2.2.1;
- b. Design the basin or impoundment to avoid collecting water from wetlands;
- c. Design the basin or impoundment to provide storage for either:

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<sup>21</sup> Stockpiling topsoil at off-site locations, or transferring topsoil to other locations, is an example of a practice that is consistent with the requirements in Part 2.2.8. Preserving native topsoil is not required where the intended function of a specific area of the site dictates that the topsoil be disturbed or removed. For example, some sites may be designed to be highly impervious after construction, and therefore little or no vegetation is intended to remain, or may not have space to stockpile native topsoil on site for later use, in which case, it may not be feasible to preserve topsoil.

<sup>22</sup> Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted.

<sup>23</sup> Inlet protection measures can be removed in the event of flood conditions or to prevent erosion.

<sup>24</sup> Examples of velocity dissipation devices include check dams, sediment traps, riprap, and grouted riprap at outlets.

- ii. The calculated volume of runoff from a 2-year, 24-hour storm (see Appendix H); or
- iii. 3,600 cubic feet per acre drained.
- d. Utilize outlet structures that withdraw water from the surface of the sediment basin or similar impoundment, unless infeasible;<sup>25</sup>
- e. Use erosion controls and velocity dissipation devices to prevent erosion at inlets and outlets; and
- f. Remove accumulated sediment to maintain at least one-half of the design capacity and conduct all other appropriate maintenance to ensure the basin or impoundment remains in effective operating condition.

**2.2.13 If using treatment chemicals (e.g., polymers, flocculants, coagulants):**

- a. **Use conventional erosion and sediment controls before and after the application of treatment chemicals.** Chemicals may only be applied where treated stormwater is directed to a sediment control (e.g., *sediment basin, perimeter control*) before discharge.
- b. **Select appropriate treatment chemicals.** Chemicals must be appropriately suited to the types of soils likely to be exposed during construction and present in the discharges being treated (i.e., *the expected turbidity, pH, and flow rate of stormwater flowing into the chemical treatment system or area*).
- c. **Minimize discharge risk from stored chemicals.** Store all treatment chemicals in leak-proof containers that are kept under storm-resistant cover and surrounded by secondary containment structures (e.g., *spill berms, decks, spill containment pallets*), or provide equivalent measures designed and maintained to minimize the potential discharge of treatment chemicals in stormwater or by any other means (e.g., *storing chemicals in a covered area, having a spill kit available on site and ensuring personnel are available to respond expeditiously in the event of a leak or spill*).
- d. **Comply with state/local requirements.** Comply with applicable state and local requirements regarding the use of treatment chemicals.
- e. **Use chemicals in accordance with good engineering practices and specifications of the chemical provider/supplier.** Use treatment chemicals and chemical treatment systems in accordance with good engineering practices, and with dosing specifications and sediment removal design specifications provided by the provider/supplier of the applicable chemicals, or document in your SWPPP specific departures from these specifications and how they reflect good engineering practice.
- f. **Ensure proper training.** Ensure that all persons who handle and use treatment chemicals at the construction site are provided with appropriate, product-specific training. Among other things, the training must cover proper dosing requirements.
- g. **Perform additional measures specified by the EPA Regional Office for the authorized use of cationic chemicals.** If you have been authorized to use cationic chemicals at your site pursuant to Part 1.1.9, you must perform all additional measures as

<sup>25</sup> The circumstances in which it is infeasible to design outlet structures in this manner are rare. Exceptions may include areas with extended cold weather, where using surface outlets may not be feasible during certain time periods (although they must be used during other periods). If you determine that it is infeasible to meet this requirement, you must provide documentation in your SWPPP to support your determination, including the specific conditions or time periods when this exception will apply.

conditioned by your authorization to ensure that the use of such chemicals will not cause an exceedance of water quality standards.

**2.2.14 Stabilize exposed portions of the site.** Implement and maintain stabilization measures (e.g., seeding protected by erosion controls until vegetation is established, sodding, mulching, erosion control blankets, hydromulch, gravel) that minimize erosion from exposed portions of the site in accordance with Parts 2.2.14a and 2.2.14b.

**a. Stabilization Deadlines:**<sup>26</sup>

| Total Amount of Land Disturbance Occurring At Any One Time <sup>27</sup>  | Deadline  |
|---|---|
| <p><b>i. Five acres or less (<math>\leq 5.0</math>)</b><br/> <b>Note: this includes sites disturbing more than five acres (<math>&gt;5.0</math>) total over the course of a project, but that limit disturbance at any one time (i.e., phase the disturbance) to five acres or less (<math>\leq 5.0</math>)</b></p> | <ul style="list-style-type: none"> <li>Initiate the installation of stabilization measures immediately<sup>28</sup> in any areas of exposed soil where construction activities have permanently ceased or will be temporarily inactive for 14 or more calendar days;<sup>29</sup> and</li> <li>Complete the installation of stabilization measures as soon as practicable, but no later than 14 calendar days after stabilization has been initiated.<sup>30</sup></li> </ul> |

<sup>26</sup> EPA may determine, based on an inspection carried out under Part 4.8 and corrective actions required under Part 5.3, that the level of sediment discharge on the site makes it necessary to require a faster schedule for completing stabilization. For instance, if sediment discharges from an area of exposed soil that is required to be stabilized are compromising the performance of existing stormwater controls, EPA may require stabilization to correct this problem.

<sup>27</sup> Limiting disturbances to five (5) acres or less at any one time means that at no time during the project do the cumulative earth disturbances exceed five (5) acres. The following examples would qualify as limiting disturbances at any one time to five (5) acres or less:

1. The total area of disturbance for a project is five (5) acres or less.
2. The total area of disturbance for a project will exceed five (5) acres, but the operator ensures that no more than five (5) acres will be disturbed at any one time through implementation of stabilization measures. In this way, site stabilization can be used to "free up" land that can be disturbed without exceeding the five (5)-acre cap to qualify for the 14-day stabilization deadline. For instance, if an operator completes stabilization of two (2) acres of land on a five (5)-acre disturbance, then two (2) additional acres could be disturbed while still qualifying for the longer 14-day stabilization deadline.

<sup>28</sup> The following are examples of activities that would constitute the immediate initiation of stabilization:

1. Prepping the soil for vegetative or non-vegetative stabilization as long as seeding, planting, and/or installation of non-vegetative stabilization products takes place as soon as practicable, but no later than one (1) calendar day of completing soil preparation;
2. Applying mulch or other non-vegetative product to the exposed area;
3. Seeding or planting the exposed area;
4. Starting any of the activities in # 1 – 3 on a portion of the entire area that will be stabilized; and
5. Finalizing arrangements to have stabilization product fully installed in compliance with the deadlines for completing stabilization.

<sup>29</sup> The requirement to initiate stabilization immediately is triggered as soon as you know that construction work on a portion of the site is temporarily ceased and will not resume for 14 or more days, or as soon as you know that construction work is permanently ceased. In the context of this provision, "immediately" means as soon as practicable, but no later than the end of the next business day, following the day when the construction activities have temporarily or permanently ceased.

<sup>30</sup> If vegetative stabilization measures are being implemented, stabilization is considered "installed" when all activities necessary to seed or plant the area are completed. If non-vegetative stabilization measures are being implemented, stabilization is considered "installed" when all such measures are implemented or applied.



| Total Amount of Land Disturbance Occurring At Any One Time <sup>27</sup> | Deadline   |
|--|--|
| ii. <b>More than five acres (&gt;5.0)</b>                                | <ul style="list-style-type: none"> <li>Initiate the installation of stabilization measures immediately<sup>31</sup> in any areas of exposed soil where construction activities have permanently ceased or will be temporarily inactive for 14 or more calendar days;<sup>32</sup> and</li> <li>Complete the installation of stabilization measures as soon as practicable, but no later than seven (7) calendar days after stabilization has been initiated.<sup>33</sup></li> </ul> |

iii. **Exceptions:**

**(a) Arid, semi-arid, and drought-stricken areas** (as defined in Appendix A). If it is the seasonally dry period or a period in which drought is occurring, and vegetative stabilization measures are being used:

- (i) Immediately initiate and, within 14 calendar days of a temporary or permanent cessation of work in any portion of your site, complete the installation of temporary non-vegetative stabilization measures to the extent necessary to prevent erosion;
- (ii) As soon as practicable, given conditions or circumstances on the site, complete all activities necessary to seed or plant the area to be stabilized; and
- (iii) If construction is occurring during the seasonally dry period, indicate in your SWPPP the beginning and ending dates of the seasonally dry period and your site conditions. Also include the schedule you will follow for initiating and completing vegetative stabilization.

**(b) Operators that are affected by unforeseen circumstances<sup>34</sup> that delay the initiation and/or completion of vegetative stabilization:**

- (i) Immediately initiate and, within 14 calendar days, complete the installation of temporary non-vegetative stabilization measures to prevent erosion;
- (ii) Complete all soil conditioning, seeding, watering or irrigation installation, mulching, and other required activities related to the planting and initial establishment of vegetation as soon as conditions or circumstances allow it on your site; and
- (iii) Document in the SWPPP the circumstances that prevent you from meeting the deadlines in Part 2.2.14a and the schedule you will follow for initiating and completing stabilization.

**(c) Discharges to a sediment- or nutrient-impaired water or to a water that is identified by your state, tribe, or EPA as Tier 2, Tier 2.5, or Tier 3 for antidegradation purposes.** Complete stabilization as soon as practicable, but no later than seven (7) calendar days after stabilization has been initiated.

<sup>31</sup> See footnote 27

<sup>32</sup> See footnote 28

<sup>33</sup> See footnote 29

<sup>34</sup> Examples include problems with the supply of seed stock or with the availability of specialized equipment and unsuitability of soil conditions due to excessive precipitation and/or flooding.

b. **Final Stabilization Criteria** (for any areas not covered by permanent structures):

- i. Establish uniform, perennial vegetation (*i.e., evenly distributed, without large bare areas*) that provides 70 percent or more of the cover that is provided by vegetation native to local undisturbed areas; and/or
- ii. Implement permanent non-vegetative stabilization measures<sup>35</sup> to provide effective cover.
- iii. **Exceptions:**
  - (a) **Arid, semi-arid, and drought-stricken areas** (as defined in Appendix A). Final stabilization is met if the area has been seeded or planted to establish vegetation that provides 70 percent or more of the cover that is provided by vegetation native to local undisturbed areas within three (3) years and, to the extent necessary to prevent erosion on the seeded or planted area, non-vegetative erosion controls have been applied that provide cover for at least three years without active maintenance.
  - (b) **Disturbed areas on agricultural land that are restored to their preconstruction agricultural use.** The Part 2.2.14b final stabilization criteria does not apply.
  - (c) **Areas that need to remain disturbed.** In limited circumstances, stabilization may not be required if the intended function of a specific area of the site necessitates that it remain disturbed, and only the minimum area needed remains disturbed (*e.g., dirt access roads, utility pole pads, areas being used for storage of vehicles, equipment, materials*).

## 2.3 POLLUTION PREVENTION REQUIREMENTS<sup>36</sup>

You must implement pollution prevention controls in accordance with the following requirements to minimize the discharge of pollutants in stormwater and to prevent the discharge of pollutants from spilled or leaked materials from construction activities.

### 2.3.1 For equipment and vehicle fueling and maintenance:

- a. Provide an effective means of eliminating the discharge of spilled or leaked chemicals, including fuels and oils, from these activities;<sup>37</sup>

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<sup>35</sup> Examples of permanent non-vegetative stabilization measures include riprap, gravel, gabions, and geotextiles.

<sup>36</sup> Under this permit, you are not required to minimize exposure for any products or materials where the exposure to precipitation and to stormwater will not result in a discharge of pollutants, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use).

<sup>37</sup> Examples of effective means include:

- Locating activities away from waters of the U.S. and stormwater inlets or conveyances so that stormwater coming into contact with these activities cannot reach waters of the U.S.;
- Providing secondary containment (*e.g., spill berms, decks, spill containment pallets*) and cover where appropriate; and
- Having a spill kit available on site and ensuring personnel are available to respond expeditiously in the event of a leak or spill.

- b. If applicable, comply with the Spill Prevention Control and Countermeasures (SPCC) requirements in 40 CFR part 112 and Section 311 of the CWA;
- c. Ensure adequate supplies are available at all times to handle spills, leaks, and disposal of used liquids;
- d. Use drip pans and absorbents under or around leaky vehicles;
- e. Dispose of or recycle oil and oily wastes in accordance with other federal, state, tribal, or local requirements; and
- f. Clean up spills or contaminated surfaces immediately, using dry clean up measures (do not clean contaminated surfaces by hosing the area down), and eliminate the source of the spill to prevent a discharge or a continuation of an ongoing discharge.

### **2.3.2 For equipment and vehicle washing:**

- a. Provide an effective means of minimizing the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other types of wash waters;<sup>38</sup>
- b. Ensure there is no discharge of soaps, solvents, or detergents in equipment and vehicle wash water; and
- c. For storage of soaps, detergents, or solvents, provide either (1) cover (*e.g., plastic sheeting, temporary roofs*) to minimize the exposure of these detergents to precipitation and to stormwater, or (2) a similarly effective means designed to minimize the discharge of pollutants from these areas.

### **2.3.3 For storage, handling, and disposal of building products, materials, and wastes:**

- a. *For building materials and building products*<sup>39</sup>, provide either (1) cover (*e.g., plastic sheeting, temporary roofs*) to minimize the exposure of these products to precipitation and to stormwater, or (2) a similarly effective means designed to minimize the discharge of pollutants from these areas.
- b. *For pesticides, herbicides, insecticides, fertilizers, and landscape materials:*
  - i. In storage areas, provide either (1) cover (*e.g., plastic sheeting, temporary roofs*) to minimize the exposure of these chemicals to precipitation and to stormwater, or (2) a similarly effective means designed to minimize the discharge of pollutants from these areas; and
  - ii. Comply with all application and disposal requirements included on the registered pesticide, herbicide, insecticide, and fertilizer label (see also Part 2.3.5).
- c. *For diesel fuel, oil, hydraulic fluids, other petroleum products, and other chemicals:*
  - i. Store chemicals in water-tight containers, and provide either (1) cover (*e.g., plastic sheeting, temporary roofs*) to minimize the exposure of these containers to precipitation and to stormwater, or (2) a similarly effective means designed to minimize the discharge of pollutants from these areas (*e.g., having a spill kit available on site and ensuring personnel are available to respond expeditiously in*

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<sup>38</sup> Examples of effective means include locating activities away from waters of the U.S. and stormwater inlets or conveyances and directing wash waters to a sediment basin or sediment trap, using filtration devices, such as filter bags or sand filters, or using other similarly effective controls.

<sup>39</sup> Examples of building materials and building products typically present at construction sites include asphalt sealants, copper flashing, roofing materials, adhesives, concrete admixtures, and gravel and mulch stockpiles.

*the event of a leak or spill*), or provide secondary containment (e.g., *spill berms, decks, spill containment pallets*); and

- ii. Clean up spills immediately, using dry clean-up methods where possible, and dispose of used materials properly. You are prohibited from hosing the area down to clean surfaces or spills. Eliminate the source of the spill to prevent a discharge or a furtherance of an ongoing discharge.
- d. *For hazardous or toxic wastes:*<sup>40</sup>
  - i. Separate hazardous or toxic waste from construction and domestic waste;
  - ii. Store waste in sealed containers, which are constructed of suitable materials to prevent leakage and corrosion, and which are labeled in accordance with applicable Resource Conservation and Recovery Act (RCRA) requirements and all other applicable federal, state, tribal, or local requirements;
  - iii. Store all outside containers within appropriately-sized secondary containment (e.g., *spill berms, decks, spill containment pallets*) to prevent spills from being discharged, or provide a similarly effective means designed to prevent the discharge of pollutants from these areas (e.g., *storing chemicals in a covered area, having a spill kit available on site*);
  - iv. Dispose of hazardous or toxic waste in accordance with the manufacturer's recommended method of disposal and in compliance with federal, state, tribal, and local requirements;
  - v. Clean up spills immediately, using dry clean-up methods, and dispose of used materials properly. You are prohibited from hosing the area down to clean surfaces or spills. Eliminate the source of the spill to prevent a discharge or a furtherance of an ongoing discharge; and
  - vi. Follow all other federal, state, tribal, and local requirements regarding hazardous or toxic waste.
- e. *For construction and domestic wastes:*<sup>41</sup>
  - i. Provide waste containers (e.g., *dumpster, trash receptacle*) of sufficient size and number to contain construction and domestic wastes;
  - ii. Keep waste container lids closed when not in use and close lids at the end of the business day for those containers that are actively used throughout the day. For waste containers that do not have lids, provide either (1) cover (e.g., *a tarp, plastic sheeting, temporary roof*) to minimize exposure of wastes to precipitation, or (2) a similarly effective means designed to minimize the discharge of pollutants (e.g., *secondary containment*);
  - iii. On business days, clean up and dispose of waste in designated waste containers; and
  - iv. Clean up immediately if containers overflow.

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<sup>40</sup> Examples of hazardous or toxic waste that may be present at construction sites include paints, caulks, sealants, fluorescent light ballasts, solvents, petroleum-based products, wood preservatives, additives, curing compounds, and acids.

<sup>41</sup> Examples of construction and domestic waste include packaging materials, scrap construction materials, masonry products, timber, pipe and electrical cuttings, plastics, styrofoam, concrete, demolition debris; and other trash or building materials.

- f. *For sanitary waste, position portable toilets so that they are secure and will not be tipped or knocked over, and located away from waters of the U.S. and stormwater inlets or conveyances.*

**2.3.4 For washing applicators and containers used for stucco, paint, concrete, form release oils, curing compounds, or other materials:**

- a. Direct wash water into a leak-proof container or leak-proof and lined pit designed so that no overflows can occur due to inadequate sizing or precipitation;
- b. Handle washout or cleanout wastes as follows:
  - i. Do not dump liquid wastes in storm sewers or waters of the U.S.;
  - ii. Dispose of liquid wastes in accordance with applicable requirements in Part 2.3.3; and
  - iii. Remove and dispose of hardened concrete waste consistent with your handling of other construction wastes in Part 2.3.3; and
- c. Locate any washout or cleanout activities as far away as possible from waters of the U.S. and stormwater inlets or conveyances, and, to the extent feasible, designate areas to be used for these activities and conduct such activities only in these areas.

**2.3.5 For the application of fertilizers:**

- a. Apply at a rate and in amounts consistent with manufacturer's specifications, or document in the SWPPP departures from the manufacturer specifications where appropriate in accordance with Part 7.2.6.b.ix;
- b. Apply at the appropriate time of year for your location, and preferably timed to coincide as closely as possible to the period of maximum vegetation uptake and growth;
- c. Avoid applying before heavy rains that could cause excess nutrients to be discharged;
- d. Never apply to frozen ground;
- e. Never apply to stormwater conveyance channels; and
- f. Follow all other federal, state, tribal, and local requirements regarding fertilizer application.

**2.3.6 Emergency Spill Notification Requirements**

Discharges of toxic or hazardous substances from a spill or other release are prohibited, consistent with Part 1.3.5. Where a leak, spill, or other release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR 110, 40 CFR 117, or 40 CFR 302 occurs during a 24-hour period, you must notify the National Response Center (NRC) at (800) 424-8802 or, in the Washington, DC metropolitan area, call (202) 267-2675 in accordance with the requirements of 40 CFR 110, 40 CFR 117, and 40 CFR 302 as soon as you have knowledge of the release. You must also, within seven (7) calendar days of knowledge of the release, provide a description of the release, the circumstances leading to the release, and the date of the release. State, tribal, or local requirements may necessitate additional reporting of spills or discharges to local emergency response, public health, or drinking water supply agencies.

## **2.4 CONSTRUCTION DEWATERING REQUIREMENTS**

Comply with the following requirements to minimize the discharge of pollutants in ground water or accumulated stormwater that is removed from excavations, trenches, foundations, vaults, or other similar points of accumulation, in accordance with Part 1.2.2.<sup>42</sup>

- 2.4.1** Treat dewatering discharges with controls to minimize discharges of pollutants;<sup>43</sup>
- 2.4.2** Do not discharge visible floating solids or foam;
- 2.4.3** Use an oil-water separator or suitable filtration device (such as a cartridge filter) that is designed to remove oil, grease, or other products if dewatering water is found to contain these materials;
- 2.4.4** To the extent feasible, use vegetated, upland areas of the site to infiltrate dewatering water before discharge. You are prohibited from using waters of the U.S. as part of the treatment area;
- 2.4.5** At all points where dewatering water is discharged, comply with the velocity dissipation requirements of Part 2.2.11;
- 2.4.6** With backwash water, either haul it away for disposal or return it to the beginning of the treatment process; and
- 2.4.7** Replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications.

## **3 WATER QUALITY-BASED EFFLUENT LIMITATIONS**

### **3.1 GENERAL EFFLUENT LIMITATION TO MEET APPLICABLE WATER QUALITY STANDARDS**

Discharges must be controlled as necessary to meet applicable water quality standards. Discharges must also comply with any additional state or tribal requirements that are in Part 9.

In the absence of information demonstrating otherwise, EPA expects that compliance with the conditions in this permit will result in stormwater discharges being controlled as necessary to meet applicable water quality standards. If at any time you become aware, or EPA determines, that discharges are not being controlled as necessary to meet applicable water quality standards, you must take corrective action as required in Parts 5.1 and 5.2, and document the corrective actions as required in Part 5.4.

EPA may insist that you install additional controls (to meet the narrative water quality-based effluent limit above) on a site-specific basis, or require you to obtain coverage under an individual permit, if information in your NOI or from other sources indicates that your discharges are not controlled as necessary to meet applicable water quality

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<sup>42</sup> Uncontaminated, clear (non-turbid) dewatering water can be discharged without being routed to a control.

<sup>43</sup> Appropriate controls include sediment basins or sediment traps, sediment socks, dewatering tanks, tube settlers, weir tanks, filtration systems (e.g., *bag or sand filters*), and passive treatment systems that are designed to remove sediment. Appropriate controls to use downstream of dewatering controls to minimize erosion include vegetated buffers, check dams, riprap, and grouted riprap at outlets.

standards. This includes situations where additional controls are necessary to comply with a wasteload allocation in an EPA-established or approved TMDL.

If during your coverage under a previous permit, you were required to install and maintain stormwater controls specifically to meet the assumptions and requirements of an EPA-approved or established TMDL (for any parameter) or to otherwise control your discharge to meet water quality standards, you must continue to implement such controls as part of your coverage under this permit.

### **3.2 DISCHARGE LIMITATIONS FOR SITES DISCHARGING TO SENSITIVE WATERS<sup>44</sup>**

For any portion of the site that discharges to a sediment or nutrient-impaired water or to a water that is identified by your state, tribe, or EPA as Tier 2, Tier 2.5, or Tier 3 for antidegradation purposes, you must comply with the inspection frequency specified in 4.3 and you must comply with the stabilization deadline specified in Part 2.2.14.a.iii.(c).<sup>45</sup>

If you discharge to a water that is impaired for a parameter other than a sediment-related parameter or nutrients, EPA will inform you if any additional controls are necessary for your discharge to be controlled as necessary to meet water quality standards, including for it to be consistent with the assumptions of any available wasteload allocation in any applicable TMDL, or if coverage under an individual permit is necessary.

In addition, on a case-by-case basis, EPA may notify operators of new sites or operators of existing sites with increased discharges that additional analyses, stormwater controls, or other measures are necessary to comply with the applicable antidegradation requirements, or notify you that an individual permit application is necessary.

If you discharge to a water that is impaired for polychlorinated biphenyls (PCBs) and are engaging in demolition of any structure with at least 10,000 square feet of floor space built or renovated before January 1, 1980, you must:

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<sup>44</sup> Sensitive waters include waters that are impaired and Tier 2, Tier 2.5, and Tier 3 waters.

"Impaired waters" are those waters identified by the state, tribe, or EPA as not meeting an applicable water quality standard and (1) requires development of a TMDL (pursuant to section 303(d) of the CWA; or (2) is addressed by an EPA-approved or established TMDL; or (3) is not in either of the above categories but the waterbody is covered by a pollution control program that meets the requirements of 40 CFR 130.7(b)(1). Your construction site will be considered to discharge to an impaired water if the first water of the U.S. to which you discharge is an impaired water for the pollutants contained in the discharge from your site. For discharges that enter a storm sewer system prior to discharge, the first water of the U.S. to which you discharge is the waterbody that receives the stormwater discharge from the storm sewer system. For assistance in determining whether your site discharges to impaired waters, EPA has developed a tool that is available both within the electronic NOI form in NeT, and at <https://www.epa.gov/npdes/epas-stormwater-discharge-mapping-tools>.

Tiers 2, 2.5 and 3 refer to waters either identified by the state as high quality waters or Outstanding National Resource Waters under 40 CFR 131.12(a)(2) and (3). For the purposes of this permit, you are considered to discharge to a Tier 2, Tier 2.5, or Tier 3 water if the first water of the U.S. to which you discharge is identified by a state, tribe, or EPA as Tier 2, Tier 2.5, or Tier 3. For discharges that enter a storm sewer system prior to discharge, the water of the U.S. to which you discharge is the first water of the U.S. that receives the stormwater discharge from the storm sewer system. See list of Tier 2, Tier 2.5, and Tier 3 waters in Appendix F. EPA may determine on a case-by-case basis that a site discharges to a sensitive water.

<sup>45</sup> If you qualify for any of the reduced inspection frequencies in Part 4.4, you may conduct inspections in accordance with Part 4.4 for any portion of your site that discharges to a sensitive water.

- a. Implement controls<sup>46</sup> to minimize the exposure of PCB-containing building materials, including paint, caulk, and pre-1980 fluorescent lighting fixtures, to precipitation and to stormwater; and
- b. Ensure that disposal of such materials is performed in compliance with applicable state, federal, and local laws.

## **4 SITE INSPECTION REQUIREMENTS**

### **4.1 PERSON(S) RESPONSIBLE FOR INSPECTING SITE**

The person(s) inspecting your site may be a person on your staff or a third party you hire to conduct such inspections. You are responsible for ensuring that the person who conducts inspections is a "qualified person."<sup>47</sup>

### **4.2 FREQUENCY OF INSPECTIONS.<sup>48</sup>**

At a minimum, you must conduct a site inspection in accordance with one of the two schedules listed below, unless you are subject to the Part 4.3 site inspection frequency for discharges to sensitive waters or qualify for a Part 4.4 reduction in the inspection frequency:

**4.2.1** At least once every seven (7) calendar days; or

**4.2.2** Once every 14 calendar days *and* within 24 hours of the occurrence of a storm event of 0.25 inches or greater, or the occurrence of runoff from snowmelt sufficient to cause a discharge.<sup>49</sup> To determine if a storm event of 0.25 inches or greater has occurred on your site, you must either keep a properly maintained rain gauge on your site, or obtain the storm event information from a weather station that is representative of your location. For any day of rainfall during normal business hours that measures 0.25 inches or greater, you must record the total rainfall measured for that day in accordance with Part 4.7.1d.

### **4.3 INCREASE IN INSPECTION FREQUENCY FOR SITES DISCHARGING TO SENSITIVE WATERS.**

For any portion of the site that discharges to a sediment or nutrient-impaired water or to a water that is identified by your state, tribe, or EPA as Tier 2, Tier 2.5, or Tier 3 for antidegradation purposes (see Part 3.2), instead of the inspection frequency specified in

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<sup>46</sup> Examples of controls to minimize exposure of PCBs to precipitation and stormwater include separating work areas from non-work areas and selecting appropriate personal protective equipment and tools, constructing a containment area so that all dust or debris generated by the work remains within the protected area, using tools that minimize dust and heat (<212°F). For additional information, refer to Part 2.3.3 of the CGP Fact Sheet.

<sup>47</sup> A "qualified person" is a person knowledgeable in the principles and practice of erosion and sediment controls and pollution prevention, who possesses the appropriate skills and training to assess conditions at the construction site that could impact stormwater quality, and the appropriate skills and training to assess the effectiveness of any stormwater controls selected and installed to meet the requirements of this permit.

<sup>48</sup> Inspections are only required during the site's normal working hours.

<sup>49</sup> "Within 24 hours of the occurrence of a storm event" means that you must conduct an inspection within 24 hours once a storm event has produced 0.25 inches within a 24-hour period, even if the storm event is still continuing. Thus, if you have elected to inspect bi-weekly in accordance with Part 4.2.2 and there is a storm event at your site that continues for multiple days, and each day of the storm produces 0.25 inches or more of rain, you must conduct an inspection within 24 hours of the first day of the storm and within 24 hours after the end of the storm.



Part 4.2, you must conduct inspections in accordance with the following inspection frequencies:

Once every seven (7) calendar days *and* within 24 hours of the occurrence of a storm event of 0.25 inches or greater, or the occurrence of runoff from snowmelt sufficient to cause a discharge. To determine if a storm event of 0.25 inches or greater has occurred on your site, you must either keep a properly maintained rain gauge on your site, or obtain the storm event information from a weather station that is representative of your location. For any day of rainfall during normal business hours that measures 0.25 inches or greater, you must record the total rainfall measured for that day in accordance with Part 4.7.1d.

#### **4.4 REDUCTIONS IN INSPECTION FREQUENCY**

##### **4.4.1 Stabilized areas.**

- a. You may reduce the frequency of inspections to twice per month for the first month, no more than 14 calendar days apart, then once per month in any area of your site where the stabilization steps in 2.2.14a have been completed. If construction activity resumes in this portion of the site at a later date, the inspection frequency immediately increases to that required in Parts 4.2 and 4.3, as applicable. You must document the beginning and ending dates of this period in your SWPPP.
- b. **Exception.** For "linear construction sites" (as defined in Appendix A) where disturbed portions have undergone final stabilization at the same time active construction continues on others, you may reduce the frequency of inspections to twice per month for the first month, no more than 14 calendar days apart, in any area of your site where the stabilization steps in 2.2.14a have been completed. After the first month, inspect once more within 24 hours of the occurrence of a storm event of 0.25 inches or greater. If there are no issues or evidence of stabilization problems, you may suspend further inspections. If "wash-out" of stabilization materials and/or sediment is observed, following re-stabilization, inspections must resume at the inspection frequency required in Part 4.4.1a. Inspections must continue until final stabilization is visually confirmed following a storm event of 0.25 inches or greater.

**4.4.2 Arid, semi-arid, or drought-stricken areas** (as defined in Appendix A). If it is the seasonally dry period or a period in which drought is occurring, you may reduce the frequency of inspections to once per month and within 24 hours of the occurrence of a storm event of 0.25 inches or greater. You must document that you are using this reduced schedule and the beginning and ending dates of the seasonally dry period in your SWPPP. To determine if a storm event of 0.25 inches or greater has occurred on your site, you must either keep a properly maintained rain gauge on your site, or obtain the storm event information from a weather station that is representative of your location. For any day of rainfall during normal business hours that measures 0.25 inches or greater, you must record the total rainfall measured for that day in accordance with Part 4.7.1d.

##### **4.4.3 Frozen conditions:**

- a. If you are suspending construction activities due to frozen conditions, you may temporarily suspend inspections on your site until thawing conditions (as defined in Appendix A) begin to occur if:

- i. Runoff is unlikely due to continuous frozen conditions that are likely to continue at your site for at least three (3) months based on historic seasonal averages. If unexpected weather conditions (such as above freezing temperatures or rain events) make discharges likely, you must immediately resume your regular inspection frequency as described in Parts 4.2 and 4.3, as applicable;
  - ii. Land disturbances have been suspended; and
  - iii. All disturbed areas of the site have been stabilized in accordance with Part 2.2.14a.
- b. If you are still conducting construction activities during frozen conditions, you may reduce your inspection frequency to once per month if:
  - i. Runoff is unlikely due to continuous frozen conditions that are likely to continue at your site for at least three (3) months based on historic seasonal averages. If unexpected weather conditions (such as above freezing temperatures or rain events) make discharges likely, you must immediately resume your regular inspection frequency as described in Parts 4.2 and 4.3, as applicable; and
  - ii. Except for areas in which you are actively conducting construction activities, disturbed areas of the site have been stabilized in accordance with Part 2.2.14a.

You must document the beginning and ending dates of this period in your SWPPP.

#### **4.5 AREAS THAT MUST BE INSPECTED**

During your site inspection, you must at a minimum inspect the following areas of your site:

- 4.5.1** All areas that have been cleared, graded, or excavated and that have not yet completed stabilization consistent with Part 2.2.14a;
- 4.5.2** All stormwater controls (including pollution prevention controls) installed at the site to comply with this permit;<sup>50</sup>
- 4.5.3** Material, waste, borrow, and equipment storage and maintenance areas that are covered by this permit;
- 4.5.4** All areas where stormwater typically flows within the site, including drainageways designed to divert, convey, and/or treat stormwater;
- 4.5.5** All points of discharge from the site; and
- 4.5.6** All locations where stabilization measures have been implemented.

You are not required to inspect areas that, at the time of the inspection, are considered unsafe to your inspection personnel.

#### **4.6 REQUIREMENTS FOR INSPECTIONS**

During your site inspection, you must at a minimum:

- 4.6.1** Check whether all stormwater controls (*i.e., erosion and sediment controls and pollution prevention controls*) are properly installed, appear to be operational, and are working as intended to minimize pollutant discharges;

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<sup>50</sup> This includes the requirement to inspect for sediment that has been tracked out from the site onto paved roads, sidewalks, or other paved areas consistent with Part 2.2.4.

- 4.6.2** Check for the presence of conditions that could lead to spills, leaks, or other accumulations of pollutants on the site;
- 4.6.3** Identify any locations where new or modified stormwater controls are necessary to meet the requirements of Parts 2 and/or 3;
- 4.6.4** Check for signs of visible erosion and sedimentation (*i.e., sediment deposits*) that have occurred and are attributable to your discharge at points of discharge and, if applicable, the banks of any waters of the U.S. flowing within or immediately adjacent to the site;
- 4.6.5** Identify any incidents of noncompliance observed;
- 4.6.6** If a discharge is occurring during your inspection:
  - a. Identify all discharge points at the site; and
  - b. Observe and document the visual quality of the discharge, and take note of the characteristics of the stormwater discharge, including color; odor; floating, settled, or suspended solids; foam; oil sheen; and other indicators of stormwater pollutants.
- 4.6.7** Based on the results of your inspection, complete any necessary maintenance under Part 2.1.4 and corrective action under Part 5.

#### **4.7 INSPECTION REPORT**

- 4.7.1** You must complete an inspection report within 24 hours of completing any site inspection. Each inspection report must include the following:
  - a. The inspection date;
  - b. Names and titles of personnel making the inspection;
  - c. A summary of your inspection findings, covering at a minimum the observations you made in accordance with Part 4.6, including any necessary maintenance or corrective actions;
  - d. If you are inspecting your site at the frequency specified in Part 4.2.2, Part 4.3, or Part 4.4.1b, and you conducted an inspection because of rainfall measuring 0.25 inches or greater, you must include the applicable rain gauge or weather station readings that triggered the inspection; and
  - e. If you determined that it is unsafe to inspect a portion of your site, you must describe the reason you found it to be unsafe and specify the locations to which this condition applies.
- 4.7.2** Each inspection report must be signed in accordance with Appendix I, Part I.11 of this permit.
- 4.7.3** You must keep a copy of all inspection reports at the site or at an easily accessible location, so that it can be made available at the time of an on-site inspection or upon request by EPA.
- 4.7.4** You must retain all inspection reports completed for this Part for at least three (3) years from the date that your permit coverage expires or is terminated.

**4.8 INSPECTIONS BY EPA**

You must allow EPA, or an authorized representative of EPA, to conduct the following activities at reasonable times. To the extent that you are utilizing shared controls that are not on site to comply with this permit, you must make arrangements for EPA to have access at all reasonable times to those areas where the shared controls are located.

- 4.8.1** Enter onto all areas of the site, including any construction support activity areas covered by this permit, any off-site areas where shared controls are utilized to comply with this permit, discharge locations, adjoining waterbodies, and locations where records are kept under the conditions of this permit;
- 4.8.2** Access and copy any records that must be kept under the conditions of this permit;
- 4.8.3** Inspect your construction site, including any construction support activity areas covered by this permit (see Part 1.2.1c), any stormwater controls installed and maintained at the site, and any off-site shared controls utilized to comply with this permit; and
- 4.8.4** Sample or monitor for the purpose of ensuring compliance.

**5 CORRECTIVE ACTIONS****5.1 CONDITIONS TRIGGERING CORRECTIVE ACTION.**

You must take corrective action to address any of the following conditions identified at your site:

- 5.1.1** A stormwater control needs repair or replacement (beyond routine maintenance required under Part 2.1.4); or
- 5.1.2** A stormwater control necessary to comply with the requirements of this permit was never installed, or was installed incorrectly; or
- 5.1.3** Your discharges are causing an exceedance of applicable water quality standards; or
- 5.1.4** A prohibited discharge has occurred (see Part 1.3).

**5.2 CORRECTIVE ACTION DEADLINES**

For any corrective action triggering conditions in Part 5.1, you must:

- 5.2.1** Immediately take all reasonable steps to address the condition, including cleaning up any contaminated surfaces so the material will not discharge in subsequent storm events;
- 5.2.2** When the problem does not require a new or replacement control or significant repair, the corrective action must be completed by the close of the next business day;
- 5.2.3** When the problem requires a new or replacement control or significant repair, install the new or modified control and make it operational, or complete the repair, by no later than seven (7) calendar days from the time of discovery. If it is infeasible to complete the installation or repair within seven (7) calendar days, you must document in your records why it is infeasible to complete the installation or repair within the 7-day timeframe and document your schedule for installing the stormwater control(s) and making it operational as soon as feasible after the 7-day timeframe. Where these actions result in changes to any of the stormwater controls or procedures documented in your SWPPP,

you must modify your SWPPP accordingly within seven (7) calendar days of completing this work.

### **5.3 CORRECTIVE ACTION REQUIRED BY EPA**

You must comply with any corrective actions required by EPA as a result of permit violations found during an inspection carried out under Part 4.8.

### **5.4 CORRECTIVE ACTION REPORT**

For each corrective action taken in accordance with this Part, you must complete a report in accordance with the following:

- 5.4.1** Within 24 hours of identifying the corrective action condition, document the specific condition and the date and time it was identified.
- 5.4.2** Within 24 hours of completing the corrective action (in accordance with the deadlines in Part 5.2), document the actions taken to address the condition, including whether any SWPPP modifications are required.
- 5.4.3** Each corrective action report must be signed in accordance with Appendix I, Part I.11 of this permit.
- 5.4.4** You must keep a copy of all corrective action reports at the site or at an easily accessible location, so that it can be made available at the time of an on-site inspection or upon request by EPA.
- 5.4.5** You must retain all corrective action reports completed for this Part for at least three (3) years from the date that your permit coverage expires or is terminated.

## **6 STAFF TRAINING REQUIREMENTS**

Each operator, or group of multiple operators, must assemble a "stormwater team" to carry out compliance activities associated with the requirements in this permit.

- 6.1** Prior to the commencement of construction activities, you must ensure that the following personnel<sup>51</sup> on the stormwater team understand the requirements of this permit and their specific responsibilities with respect to those requirements:
  - a. Personnel who are responsible for the design, installation, maintenance, and/or repair of stormwater controls (including pollution prevention controls);
  - b. Personnel responsible for the application and storage of treatment chemicals (if applicable);
  - c. Personnel who are responsible for conducting inspections as required in Part 4.1; and
  - d. Personnel who are responsible for taking corrective actions as required in Part 5.

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<sup>51</sup> If the person requiring training is a new employee who starts after you commence construction activities, you must ensure that this person has the proper understanding as required above prior to assuming particular responsibilities related to compliance with this permit.

For emergency-related projects, the requirement to train personnel prior to commencement of construction activities does not apply, however, such personnel must have the required training prior to NOI submission.

- 6.2** You are responsible for ensuring that all activities on the site comply with the requirements of this permit. You are not required to provide or document formal training for subcontractors or other outside service providers, but you must ensure that such personnel understand any requirements of this permit that may be affected by the work they are subcontracted to perform.
- 6.3** At a minimum, members of the stormwater team must be trained to understand the following if related to the scope of their job duties (*e.g., only personnel responsible for conducting inspections need to understand how to conduct inspections*):
- The permit deadlines associated with installation, maintenance, and removal of stormwater controls and with stabilization;
  - The location of all stormwater controls on the site required by this permit and how they are to be maintained;
  - The proper procedures to follow with respect to the permit's pollution prevention requirements; and
  - When and how to conduct inspections, record applicable findings, and take corrective actions.
- 6.4** Each member of the stormwater team must have easy access to an electronic or paper copy of applicable portions of this permit, the most updated copy of your SWPPP, and other relevant documents or information that must be kept with the SWPPP.

## **7 STORMWATER POLLUTION PREVENTION PLAN (SWPPP)**

### **7.1 GENERAL REQUIREMENTS**

All operators associated with a construction site under this permit must develop a SWPPP consistent with the requirements in Part 7 prior to their submittal of the NOI.<sup>52, 53</sup> The SWPPP must be kept up-to-date throughout coverage under this permit.

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<sup>52</sup> The SWPPP does not establish the effluent limits that apply to your site's discharges; these limits are established in this permit in Parts 2 and 3.

<sup>53</sup> You have the option of developing a group SWPPP where you are one of several operators at your site. For instance, if both the owner and the general contractor of the construction site are operators and thus are both required to obtain a permit, the owner may be the party undertaking SWPPP development, and the general contractor (or any other operator at the site) can choose to use this same SWPPP, as long as the SWPPP addresses the general contractor's (or other operator's) scope of construction work and functions to be performed under the SWPPP. Regardless of whether there is a group SWPPP or several individual SWPPPs, all operators would be jointly and severally liable for compliance with the permit.

Where there are multiple operators associated with the same site through a common plan of development or sale, operators may assign to themselves various permit-related functions under the SWPPP provided that each SWPPP, or a group SWPPP, documents which operator will perform each function under the SWPPP. However, dividing the functions to be performed under each SWPPP, or a single group SWPPP, does not relieve an individual operator from liability for complying with the permit should another operator fail to implement any measures that are necessary for that individual operator to comply with the permit, e.g., the installation and maintenance of any shared controls. In addition, all operators must ensure, either directly or through coordination with other operators, that their activities do not cause a violation and/or render any other operators' controls and/or any shared controls ineffective. All operators who rely on a shared control to comply with the permit are jointly and severally liable for violations of the permit resulting from the failure to properly install, operate and/or maintain the shared control.

If a SWPPP was prepared under a previous version of this permit, the operator must review and update the SWPPP to ensure that this permit's requirements are addressed prior to submitting an NOI for coverage under this permit.

## **7.2 SWPPP CONTENTS**

At a minimum, the SWPPP must include the information specified in this Part and as specified in other parts of this permit.

**7.2.1 All Site Operators.** Include a list of all other operators who will be engaged in construction activities at the site, and the areas of the site over which each operator has control.

**7.2.2 Stormwater Team.** Identify the personnel (by name or position) that are part of the stormwater team, as well as their individual responsibilities, including which members are responsible for conducting inspections.

**7.2.3 Nature of Construction Activities.**<sup>54</sup> Include the following:

- a. A description of the nature of your construction activities, including the age or dates of past renovations for structures that are undergoing demolition;
- b. The size of the property (in acres or length in miles if a linear construction site);
- c. The total area expected to be disturbed by the construction activities (to the nearest quarter acre or nearest quarter mile if a linear construction site);
- d. A description of any on-site and off-site construction support activity areas covered by this permit (see Part 1.2.1c);
- e. The maximum area expected to be disturbed at any one time, including on-site and off-site construction support activity areas;
- f. A description and projected schedule for the following:
  - i. Commencement of construction activities in each portion of the site, including clearing and grubbing, mass grading, demolition activities, site preparation (*i.e.*, *excavating, cutting and filling*), final grading, and creation of soil and vegetation stockpiles requiring stabilization;
  - ii. Temporary or permanent cessation of construction activities in each portion of the site;
  - iii. Temporary or final stabilization of exposed areas for each portion of the site; and
  - iv. Removal of temporary stormwater controls and construction equipment or vehicles, and the cessation of construction-related pollutant-generating activities.
- g. A list and description of all pollutant-generating activities<sup>55</sup> on the site. For each pollutant-generating activity, include an inventory of pollutants or pollutant constituents (*e.g.*, *sediment, fertilizers, pesticides, paints, caulks, sealants, fluorescent light ballasts, contaminated substrates, solvents, fuels*) associated with that activity, which could be discharged in stormwater from your construction site. You must take

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<sup>54</sup> If plans change due to unforeseen circumstances or for other reasons, the requirement to describe the sequence and estimated dates of construction activities is not meant to "lock in" the operator to meeting these dates. When departures from initial projections are necessary, this should be documented in the SWPPP itself, or in associated records, as appropriate.

<sup>55</sup> Examples of pollutant-generating activities include paving operations; concrete, paint, and stucco washout and waste disposal; solid waste storage and disposal; and dewatering operations.

into account where potential spills and leaks could occur that contribute pollutants to stormwater discharges, and any known hazardous or toxic substances, such as PCBs and asbestos, that will be disturbed or removed during construction;

- h. Business days and hours for the project;
- i. If you are conducting construction activities in response to a public emergency (see Part 1.4), a description of the cause of the public emergency (*e.g., mud slides, earthquake, extreme flooding conditions, widespread disruption in essential public services*), information substantiating its occurrence (*e.g., state disaster declaration or similar state or local declaration*), and a description of the construction necessary to reestablish affected public services.

**7.2.4 Site Map.** Include a legible map, or series of maps, showing the following features of the site:

- a. Boundaries of the property;
- b. Locations where construction activities will occur, including:
  - i. Locations where earth-disturbing activities will occur (note any phasing), including any demolition activities;
  - ii. Approximate slopes before and after major grading activities (note any steep slopes (as defined in Appendix A));
  - iii. Locations where sediment, soil, or other construction materials will be stockpiled;
  - iv. Any water of the U.S. crossings;
  - v. Designated points where vehicles will exit onto paved roads;
  - vi. Locations of structures and other impervious surfaces upon completion of construction; and
  - vii. Locations of on-site and off-site construction support activity areas covered by this permit (see Part 1.2.1c).
- c. Locations of all waters of the U.S. within and one mile downstream of the site's discharge point. Also identify if any are listed as impaired, or are identified as a Tier 2, Tier 2.5, or Tier 3 water;
- d. Areas of federally listed critical habitat within the site and/or at discharge locations;
- e. Type and extent of pre-construction cover on the site (*e.g., vegetative cover, forest, pasture, pavement, structures*);
- f. Drainage patterns of stormwater and authorized non-stormwater before and after major grading activities;
- g. Stormwater and authorized non-stormwater discharge locations, including:
  - i. Locations where stormwater and/or authorized non-stormwater will be discharged to storm drain inlets;<sup>56</sup> and
  - ii. Locations where stormwater or authorized non-stormwater will be discharged directly to waters of the U.S.
- h. Locations of all potential pollutant-generating activities identified in Part 7.2.3g;

<sup>56</sup> The requirement to show storm drain inlets in the immediate vicinity of the site on your site map only applies to those inlets that are easily identifiable from your site or from a publicly accessible area immediately adjacent to your site.



- i. Locations of stormwater controls, including natural buffer areas and any shared controls utilized to comply with this permit; and
- j. Locations where polymers, flocculants, or other treatment chemicals will be used and stored.

**7.2.5 Non-Stormwater Discharges.** Identify all authorized non-stormwater discharges in Part 1.2.2 that will or may occur.

**7.2.6 Description of Stormwater Controls.**

- a. For each of the Part 2.2 erosion and sediment control effluent limits, Part 2.3 pollution prevention effluent limits, and Part 2.4 construction dewatering effluent limits, as applicable to your site, you must include the following:
  - i. A description of the specific control(s) to be implemented to meet the effluent limit;
  - ii. Any applicable stormwater control design specifications (including references to any manufacturer specifications and/or erosion and sediment control manuals/ordinances relied upon);<sup>57</sup>
  - iii. Routine stormwater control maintenance specifications; and
  - iv. The projected schedule for stormwater control installation/implementation.
- b. You must also include any of the following additional information as applicable.
  - i. **Natural buffers and/or equivalent sediment controls** (see Part 2.2.1 and Appendix G). You must include the following:
    - (a) The compliance alternative to be implemented;
    - (b) If complying with alternative 2, the width of natural buffer retained;
    - (c) If complying with alternative 2 or 3, the erosion and sediment control(s) you will use to achieve an equivalent sediment reduction, and any information you relied upon to demonstrate the equivalency;
    - (d) If complying with alternative 3, a description of why it is infeasible for you to provide and maintain an undisturbed natural buffer of any size;
    - (e) For "linear construction sites" where it is infeasible to implement compliance alternative 1, 2, or 3, a rationale for this determination, and a description of any buffer width retained and/or supplemental erosion and sediment controls installed; and
    - (f) A description of any disturbances that are exempt under Part 2.2.1 that occur within 50 feet of a water of the U.S.
  - ii. **Perimeter controls for a "linear construction site"** (see Part 2.2.3). For areas where perimeter controls are not feasible, include documentation to support this determination and a description of the other practices that will be implemented to minimize discharges of pollutants in stormwater associated with construction activities.

Note: Routine maintenance specifications for perimeter controls documented in the SWPPP must include the Part 2.2.3a requirement that sediment be removed

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<sup>57</sup> Design specifications may be found in manufacturer specifications and/or in applicable erosion and sediment control manuals or ordinances. Any departures from such specifications must reflect good engineering practice and must be explained in the SWPPP.

before it has accumulated to one-half of the above-ground height of any perimeter control.

- iii. **Sediment track-out controls** (see Parts 2.2.4b and 2.2.4c). Document the specific stabilization techniques and/or controls that will be implemented to remove sediment prior to vehicle exit.
- iv. **Sediment basins** (see Part 2.2.12). In circumstances where it is infeasible to utilize outlet structures that withdraw water from the surface, include documentation to support this determination, including the specific conditions or time periods when this exception will apply.
- v. **Treatment chemicals** (see Part 2.2.13), you must include the following:
  - (a) A listing of the soil types that are expected to be exposed during construction in areas of the project that will drain to chemical treatment systems. Also include a listing of soil types expected to be found in fill material to be used in these same areas, to the extent you have this information prior to construction;
  - (b) A listing of all treatment chemicals to be used at the site and why the selection of these chemicals is suited to the soil characteristics of your site;
  - (c) If the applicable EPA Regional Office authorized you to use cationic treatment chemicals for sediment control, include the specific controls and implementation procedures designed to ensure that your use of cationic treatment chemicals will not lead to an exceedance of water quality standards;
  - (d) The dosage of all treatment chemicals to be used at the site or the methodology to be used to determine dosage;
  - (e) Information from any applicable Safety Data Sheet (SDS);
  - (f) Schematic drawings of any chemically enhanced stormwater controls or chemical treatment systems to be used for application of the treatment chemicals;
  - (g) A description of how chemicals will be stored consistent with Part 2.2.13c;
  - (h) References to applicable state or local requirements affecting the use of treatment chemicals, and copies of applicable manufacturer's specifications regarding the use of your specific treatment chemicals and/or chemical treatment systems; and
  - (i) A description of the training that personnel who handle and apply chemicals have received prior to permit coverage, or will receive prior to use of the treatment chemicals at your site.
- vi. **Stabilization measures** (see Part 2.2.14). You must include the following:
  - (a) The specific vegetative and/or non-vegetative practices that will be used;
  - (b) The stabilization deadline that will be met in accordance with Part 2.2.14.a.i-ii;
  - (c) If complying with the deadlines for sites in arid, semi-arid, or drought-stricken areas, the beginning and ending dates of the seasonally dry period and the schedule you will follow for initiating and completing vegetative stabilization; and
  - (d) If complying with deadlines for sites affected by unforeseen circumstances that delay the initiation and/or completion of vegetative stabilization, document the circumstances and the schedule for initiating and completing stabilization.

- vii. **Spill prevention and response procedures** (see Part 1.3.5 and Part 2.3). You must include the following:

- (a) Procedures for expeditiously stopping, containing, and cleaning up spills, leaks, and other releases. Identify the name or position of the employee(s) responsible for detection and response of spills or leaks; and
- (b) Procedures for notification of appropriate facility personnel, emergency response agencies, and regulatory agencies where a leak, spill, or other release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity consistent with Part 2.3.6 and established under either 40 CFR 110, 40 CFR 117, or 40 CFR 302, occurs during a 24-hour period. Contact information must be in locations that are readily accessible and available to all employees.

You may also reference the existence of Spill Prevention Control and Countermeasure (SPCC) plans developed for the construction activity under Part 311 of the CWA, or spill control programs otherwise required by an NPDES permit for the construction activity, provided that you keep a copy of that other plan on site.<sup>58</sup>

- viii. **Waste management procedures** (see Part 2.3.3). Describe the procedures you will follow for handling, storing and disposing of all wastes generated at your site consistent with all applicable federal, state, tribal, and local requirements, including clearing and demolition debris, sediment removed from the site, construction and domestic waste, hazardous or toxic waste, and sanitary waste.
- ix. **Application of fertilizers** (see Part 2.3.5). Document any departures from the manufacturer specifications where appropriate.

**7.2.7** Procedures for Inspection, Maintenance, and Corrective Action. Describe the procedures you will follow for maintaining your stormwater controls, conducting site inspections, and, where necessary, taking corrective actions, in accordance with Part 2.1.4, Part 4, and Part 5 of this permit. Also include:

- a. The inspection schedule you will follow, which is based on whether your site is subject to Part 4.2 or Part 4.3, or whether your site qualifies for any of the reduced inspection frequencies in Part 4.4;
- b. If you will be conducting inspections in accordance with the inspection schedule in Part 4.2.2, Part 4.3, or Part 4.4.1b, the location of the rain gauge or the address of the weather station you will be using to obtain rainfall data;
- c. If you will be reducing your inspection frequency in accordance with Part 4.4.1b, the beginning and ending dates of the seasonally defined arid period for your area or the valid period of drought;
- d. If you will be reducing your inspection frequency in accordance with Part 4.4.3, the beginning and ending dates of frozen conditions on your site; and
- e. Any maintenance or inspection checklists or other forms that will be used.

<sup>58</sup> Even if you already have an SPCC or other spill prevention plan in existence, your plans will only be considered adequate if they meet all of the requirements of this Part, either as part of your existing plan or supplemented as part of the SWPPP.

**7.2.8 Staff Training.** Include documentation that the required personnel were, or will be, trained in accordance with Part 6.

**7.2.9 Compliance with Other Requirements.**

- a. **Threatened and Endangered Species Protection.** Include documentation required in Appendix D supporting your eligibility with regard to the protection of threatened and endangered species and designated critical habitat.
- b. **Historic Properties.** Include documentation required in Appendix E supporting your eligibility with regard to the protection of historic properties.
- c. **Safe Drinking Water Act Underground Injection Control (UIC) Requirements for Certain Subsurface Stormwater Controls.** If you are using any of the following stormwater controls at your site, document any contact you have had with the applicable state agency<sup>59</sup> or EPA Regional Office responsible for implementing the requirements for underground injection wells in the Safe Drinking Water Act and EPA's implementing regulations at 40 CFR 144 -147. Such controls would generally be considered Class V UIC wells:
  - i. Infiltration trenches (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system);
  - ii. Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate stormwater flow; and
  - iii. Drywells, seepage pits, or improved sinkholes (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system).

**7.2.10 SWPPP Certification.** You must sign and date your SWPPP in accordance with Appendix I, Part I.11.

**7.2.11 Post-Authorization Additions to the SWPPP.** Once you are authorized for coverage under this permit, you must include the following documents as part of your SWPPP:

- a. A copy of your NOI submitted to EPA along with any correspondence exchanged between you and EPA related to coverage under this permit;
- b. A copy of the acknowledgment letter you receive from NeT assigning your NPDES ID (*i.e.*, *permit tracking number*);
- c. A copy of this permit (an electronic copy easily available to the stormwater team is also acceptable).

**7.3 ON-SITE AVAILABILITY OF YOUR SWPPP**

You must keep a current copy of your SWPPP at the site or at an easily accessible location so that it can be made available at the time of an on-site inspection or upon request by EPA; a state, tribal, or local agency approving stormwater management plans; the operator of a storm sewer system receiving discharges from the site; or representatives of the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS).

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<sup>59</sup> For state UIC program contacts, refer to the following EPA website: <https://www.epa.gov/uic>.

EPA may provide access to portions of your SWPPP to a member of the public upon request. Confidential Business Information (CBI) will be withheld from the public, but may not be withheld from EPA, USFWS, or NMFS.<sup>60</sup>

If an on-site location is unavailable to keep the SWPPP when no personnel are present, notice of the plan's location must be posted near the main entrance of your construction site.

## **7.4 SWPPP MODIFICATIONS**

### **7.4.1** You must modify your SWPPP, including the site map(s), within seven (7) days of any of the following conditions:

- a. Whenever new operators become active in construction activities on your site, or you make changes to your construction plans, stormwater controls, or other activities at your site that are no longer accurately reflected in your SWPPP. This includes changes made in response to corrective actions triggered under Part 5. You do not need to modify your SWPPP if the estimated dates in Part 7.2.3f change during the course of construction;
- b. To reflect areas on your site map where operational control has been transferred (and the date of transfer) since initiating permit coverage;
- c. If inspections or investigations by EPA or its authorized representatives determine that SWPPP modifications are necessary for compliance with this permit;
- d. Where EPA determines it is necessary to install and/or implement additional controls at your site in order to meet the requirements of this permit, the following must be included in your SWPPP:
  - i. A copy of any correspondence describing such measures and requirements; and
  - ii. A description of the controls that will be used to meet such requirements.
- e. To reflect any revisions to applicable federal, state, tribal, or local requirements that affect the stormwater controls implemented at the site; and
- f. If applicable, if a change in chemical treatment systems or chemically enhanced stormwater control is made, including use of a different treatment chemical, different dosage rate, or different area of application.

### **7.4.2** You must maintain records showing the dates of all SWPPP modifications. The records must include the name of the person authorizing each change (see Part 7.2.10 above) and a brief summary of all changes.

### **7.4.3** All modifications made to the SWPPP consistent with Part 7.4 must be authorized by a person identified in Appendix I, Part I.11.b.

### **7.4.4** Upon determining that a modification to your SWPPP is required, if there are multiple operators covered under this permit, you must immediately notify any operators who may be impacted by the change to the SWPPP.

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<sup>60</sup> Information covered by a claim of confidentiality will be disclosed by EPA only to the extent of, and by means of, the procedures set forth in 40 CFR Part 2, Subpart B. In general, submitted information protected by a business confidentiality claim may be disclosed to other employees, officers, or authorized representatives of the United States concerned with implementing the CWA. The authorized representatives, including employees of other executive branch agencies, may review CBI during the course of reviewing draft regulations.

## **8 HOW TO TERMINATE COVERAGE**

Until you terminate coverage under this permit, you must comply with all conditions and effluent limitations in the permit. To terminate permit coverage, you must submit to EPA a complete and accurate Notice of Termination (NOT), which certifies that you have met the requirements for terminating in Part 8.

### **8.1 MINIMUM INFORMATION REQUIRED IN NOT**

**8.1.1** NPDES ID (*i.e.*, *permit tracking number*) provided by EPA when you received coverage under this permit;

**8.1.2** Basis for submission of the NOT (see Part 8.2);

**8.1.3** Operator contact information;

**8.1.4** Name of site and address (or a description of location if no street address is available); and

**8.1.5** **NOT certification.**

### **8.2 CONDITIONS FOR TERMINATING CGP COVERAGE**

You must terminate CGP coverage only if one or more of the following conditions has occurred:

**8.2.1** You have completed all construction activities at your site and, if applicable, construction support activities covered by this permit (see Part 1.2.1c), and you have met the following requirements:

- a. For any areas that (1) were disturbed during construction, (2) are not covered over by permanent structures, and (3) over which you had control during the construction activities, you have met the requirements for final vegetative or non-vegetative stabilization in Part 2.2.14b;
- b. You have removed and properly disposed of all construction materials, waste and waste handling devices, and have removed all equipment and vehicles that were used during construction, unless intended for long-term use following your termination of permit coverage;
- c. You have removed all stormwater controls that were installed and maintained during construction, except those that are intended for long-term use following your termination of permit coverage or those that are biodegradable; and
- d. You have removed all potential pollutants and pollutant-generating activities associated with construction, unless needed for long-term use following your termination of permit coverage; or

**8.2.2** You have transferred control of all areas of the site for which you are responsible under this permit to another operator, and that operator has submitted an NOI and obtained coverage under this permit; or

**8.2.3** Coverage under an individual or alternative general NPDES permit has been obtained.

### **8.3 HOW TO SUBMIT YOUR NOT**

You must use EPA's NPDES eReporting Tool (NeT) to electronically prepare and submit your NOT for the 2017 CGP.

To access NeT, go to <https://www.epa.gov/npdes/stormwater-discharges-construction-activities#ereporting>.

Waivers from electronic reporting may be granted as specified in Part 1.4.1. If the EPA Regional Office grants you approval to use a paper NOT, and you elect to use it, you must complete the form in Appendix K.

#### **8.4 DEADLINE FOR SUBMITTING THE NOT**

You must submit your NOT within 30 calendar days after any one of the conditions in Part 8.2 occurs.

#### **8.5 EFFECTIVE DATE OF TERMINATION OF COVERAGE**

Your authorization to discharge under this permit terminates at midnight of the calendar day that a complete NOT is submitted to EPA.

### **9 PERMIT CONDITIONS APPLICABLE TO SPECIFIC STATES, INDIAN COUNTRY LANDS, OR TERRITORIES**

The provisions in this Part provide modifications or additions to the applicable conditions of this permit to reflect specific additional conditions required as part of the state or tribal CWA Section 401 certification process, or the Coastal Zone Management Act (CZMA) certification process, or as otherwise established by the permitting authority. The specific additional revisions and requirements only apply to activities in those specific states, Indian country, and areas in certain states subject to construction projects by Federal Operators. States, Indian country, and areas subject to construction by Federal Operators not included in this Part do not have any modifications or additions to the applicable conditions of this permit.

#### **9.1 EPA REGION 1**

##### **9.1.1 NHR100000 State of New Hampshire**

- a. If you disturb 100,000 square feet or more of contiguous area, you must also apply for an Alteration of Terrain (AoT) permit from DES pursuant to RSA 485- A:17 and Env-Wq 1500. This requirement also applies to a lower disturbance threshold of 50,000 square feet or more when construction occurs within the protected shoreline under the Shoreland Water Quality Protection Act (see RSA 483-B and Env-Wq 1400). A permit application must also be filed if your project disturbs an area of greater than 2,500 square feet, is within 50 feet of any surface water, and has a flow path of 50 feet or longer disturbing a grade of 25 percent or greater. Project sites with disturbances smaller than those discussed above, that have the potential to adversely affect state surface waters, are subject to the conditions of an AoT General Permit by Rule.
- b. You must determine that any excavation dewatering discharges are not contaminated before they will be authorized as an allowable non-stormwater discharge under this permit (see Part 1.2.2). The water is considered uncontaminated if there is no groundwater contamination within 1,000 feet of the groundwater dewatering location. Information on groundwater contamination can be generated over the Internet via the NHDES web site <http://des.nh.gov/> by using the One Stop Data Mapper at <http://des.nh.gov/onestop/gis.htm>. If it is determined that the groundwater to be dewatered is near a remediation or other waste site you must

apply for the Remediation General Permit (see <https://www3.epa.gov/region1/npdes/rgp.html>.)

- c. You must treat any uncontaminated excavation dewatering discharges as necessary to remove suspended solids and turbidity. The discharges must be sampled at least once per week during weeks when discharges occur. Samples must be analyzed for total suspended solids (TSS) or turbidity and must meet monthly average and daily maximum limits of 50 milligrams per liter (mg/L) and 100 mg/L, respectively for TSS or 33 mg/l and 67 mg/l, respectively for turbidity. TSS (a.k.a. Residue, Nonfilterable) or turbidity sampling and analysis must be performed in accordance with Tables IB and II in 40 CFR 136.3 ([http://www.ecfr.gov/cgi-bin/text-idx?SID=0243e3c4283cbd7d8257eb6afc7ce9a2&mc=true&node=se40.25.136\\_13&rgn=div8](http://www.ecfr.gov/cgi-bin/text-idx?SID=0243e3c4283cbd7d8257eb6afc7ce9a2&mc=true&node=se40.25.136_13&rgn=div8)). Records of any sampling and analysis must be maintained and kept with the SWPPP for at least three years after final site stabilization.
- d. Construction site owners and operators must consider opportunities for post-construction groundwater recharge using infiltration best management practices (BMPs) during site design and preparation of the SWPPP. If your construction site is in a town that is required to obtain coverage under the NPDES General Permit for discharges from Municipal Separate Storm Sewer Systems (MS4) you may be required to use such practices. The SWPPP must include a description of any on-site infiltration that will be installed as a post-construction stormwater management measure or reasons for not employing such measures such as 1) The facility is located in a wellhead protection area as defined in RSA 485- C:2; or 2) The facility is located in an area where groundwater has been reclassified to GAA, GAI or GA2 pursuant to RSA 485-C and Env-DW 901; or 3) Any areas that would be exempt from the groundwater recharge requirements contained in Env-Wq 1507.04(e), including all land uses or activities considered to be a "High-load Area" (see Env-Wq 1502.26). For design considerations for infiltration measures see Volume II of the NH Stormwater Manual.
- e. Appendix F contains a list of Tier 2, or high quality waters. Although there is no official list of tier 2 waters, it can be assumed that all NH surface waters are tier 2 for turbidity unless 1) the surface water that you are proposing to discharge into is listed as impaired for turbidity in the states listing of impaired waters (see Surface Water Quality - Watershed Report Cards at [http://des.nh.gov/organization/divisions/water/wmb/swqa/report\\_cards.htm](http://des.nh.gov/organization/divisions/water/wmb/swqa/report_cards.htm)) or 2) sampling upstream of the proposed discharge location shows turbidity values greater than 10 NTU. A single grab sample collected during dry weather (no precipitation within 48 hours) is acceptable.
- f. To ensure compliance with RSA 485-C, RSA 485-A, RSA 485-A:13, I(a), Env-Wq 1700 and Env-Wq 302, the following information may be requested by NHDES. This information must be kept on site unless you receive a written request from NHDES that it be sent to the address shown in Part 9.1.4 (g).
  - i. A site map required in Part 7.2.4, showing the type and location of all post-construction infiltration BMPs utilized at the facility or the reason(s) why none were installed;
  - ii. A list of all non-stormwater discharges that occur at the facility, including their source locations and the control measures being used (see Part 1.2.2).



- iii. Records of sampling and analysis of TSS required for construction dewatering discharges (see Part 9.1.4 (c)).
- g. All required or requested documents must be sent to:  
  
NH Department of Environmental Services, Wastewater Engineering Bureau,  
Permits & Compliance Section  
P.O. Box 95  
Concord, NH 03302-0095

## **9.2 EPA REGION 3**

### **9.2.1 DCR100000 District of Columbia**

- a. The permittee must comply with the District of Columbia Water Pollution Control Act of 1984, as amended, (D.C. Official Code §8-103.01 *et seq.*) and its implementing regulations in Title 21, Chapters 11 and 19 of the District of Columbia Municipal Regulations. Nothing in this permit will be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to District of Columbia laws and regulations.
- b. The permittee must comply with the District of Columbia Stormwater Management, and Soil Erosion and Sediment Control in Chapter 5 of Title 21 of the District of Columbia Municipal Regulations.
- c. The permittee must comply with the District of Columbia Flood Management control in Chapter 31 of Title 20 of the District of Columbia Municipal Regulations.
- d. The Department may request a copy of the Stormwater Pollution Prevention Plan (SWPPP) and the permittee is required to submit the SWPPP to the Department with 14 days of such request. The Department may conduct an inspection of any facility covered by this permit to ensure compliance with District's law requirements including water quality.

### **9.2.2 DER10F000 Areas in the State of Delaware subject to construction by a Federal Operator**

- a. Federal agencies engaging in construction activities must submit, to DNREC, a sediment and stormwater management (S&S) plan and obtain approval from DNREC in accordance with 7 Del. C. §4010, 7 DE Admin. Code 5101, and 7 DE Admin. Code 7201.
- b. Federal agencies engaging in construction activities must provide for construction review by a certified construction reviewer in accordance with 7 Del. C. §§4010 & 4013 and 7 DE Admin. Code 5101, subsection 6.1.6.
- c. Federal agencies engaging in construction activities must certify that all responsible personnel involved in the construction project will have attended the blue card training prior to initiation of any land disturbing activity – see 7 Del. C. §§ 4002 & 4014 and 7 DE Admin. Code 5101.

## **9.3 EPA REGION 5**

### **9.3.1 MNR10I000 Indian country within the State of Minnesota**

#### **9.3.1.1 Fond du Lac Band of Lake Superior Chippewa.** The following conditions apply only to discharges on the Fond du Lac Band of Lake Superior Chippewa Reservation:

- a. A copy of the Stormwater Pollution Prevention Plan (SWPPP) must be submitted to the Office of Water Protection at least fifteen (15) days in advance of sending the Notice of Intent (NOI) to EPA. The SWPPP can be submitted electronically to [richardgitar@FDLREZ.com](mailto:richardgitar@FDLREZ.com) or by hardcopy sent to:

Fond du Lac Reservation  
Office of Water Protection  
1720 Big Lake Road  
Cloquet, MN 55720

CGP applicants are encouraged to work with the FDL Office of Water Protection in the identification of all proposed receiving.

- b. Copies of the Notice of Intent (NOI) and the Notice of Termination (NOT) must be sent to the Fond du Lac Office of Water Protection at the same time they are submitted to EPA.
- c. The turbidity limit shall NOT exceed 10% of natural background within the receiving water(s) as determined by Office of Water Protection staff.
- d. Turbidity sampling must take place within 24 hours of a ½-inch or greater rainfall event. The results of the sampling must be reported to the Office of Water Protection within 7 days of the sample collection. All sample reporting must include the date and time, location (GPS: UTM/Zone 15), and NTU. CGP applicants are encouraged to work with the Office of Water Protection in determining the most appropriate location(s) for sampling.
- e. Receiving waters with open water must be sampled for turbidity prior to any authorized discharge as determined by Office of Water Protection staff. This requirement only applies to receiving waters in which no ambient turbidity data exists.
- f. This Certification does not pertain to any new discharge to Outstanding Reservation Resource Waters (ORRW) as described in §105 b.3. of the Fond du Lac Water Quality Standards (Ordinance #12/98, as amended). Although additional waters may be designated in the future, currently Perch Lake, Rice Portage Lake, Miller Lake, Deadfish Lake, and Jaskari Lake are designated as ORRWs. New dischargers wishing to discharge to an ORRW must obtain an individual permit from EPA for stormwater discharges from large and small construction activities.
- g. All work shall be carried out in such a manner as will prevent violations of water quality criteria as stated in the Water Quality Standards of the Fond du Lac Reservation, Ordinance 12/98, as amended. This includes, but is not limited to, the prevention of any discharge that causes a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of water of the Fond du Lac Reservation for any of the uses designated in the Water Quality Standards of the Fond du Lac Reservation. These uses include wildlife, aquatic life, warm water fisheries, cold water fisheries, subsistence fishing (netting), primary contact recreation, secondary contact recreation, cultural, wild rice areas, aesthetic waters, agriculture, navigation, and commercial.
- h. Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the Fond du Lac Reservation. All spills must be reported to the appropriate emergency management

agency (National Response Center AND the State Duty Officer), and measures shall be taken immediately to prevent the pollution of waters of the Fond du Lac Reservation, including groundwater. The Fond du Lac Office of Water Protection must also be notified immediately of any spill regardless of size.

- i. This certification does not authorize impacts to cultural, historical, or archeological features or sites, or properties that may be eligible for such listing.

**9.3.1.2 Grand Portage Band of Lake Superior Chippewa.** The following conditions apply only to discharges on the Grand Portage Band of Lake Superior Chippewa Reservation:

- a. The CGP authorization is for construction activities that may occur within the exterior boundaries of the Grand Portage Reservation in accordance to the Grand Portage Land Use Ordinance. The CGP regulates stormwater discharges associated with construction sites of one acre or more in size. Only those activities specifically authorized by the CGP are authorized by this certification (the "Certification"). This Certification does not authorize impacts to cultural, historical, or archeological features or sites, or properties that may be eligible for listing as such.
- b. All construction stormwater discharges authorized by the CGP must comply with the Water Quality Standards and Water Resources Ordinance, as well as Applicable Federal Standards (as defined in the Water Resources Ordinance). As such, appropriate steps must be taken to ensure that petroleum products or other chemical pollutants are prevented from entering the Waters of the Reservation (as defined in the Water Resources Ordinance). All spills must be reported to the appropriate emergency-management agency, and measures must be taken to prevent the pollution of the Waters of the Reservation, including groundwater.
- c. The 2017 CGP requires inspections and monitoring reports of the construction site stormwater discharges by a qualified person. Monitoring and inspection reports must comply with the minimum requirements contained in the 2017 CGP. The monitoring plan must be prepared and incorporated into the Stormwater Pollution Prevention Plan (the "SWPPP"). A copy of the SWPPP must be submitted to the Board at least 30 days in advance of sending the requisite Notice of Intent to EPA. The SWPPP should be sent to:

Grand Portage Environmental Resources Board  
P.O. Box 428  
Grand Portage, MN 55605

Copies of the Notice of Intent and Notice of Termination required under the CGP must be submitted to the Board at the address above at the same time they are submitted to the EPA.

- d. If requested by the Grand Portage Environmental Department, the permittee must provide additional information necessary for a case-by-case eligibility determination to assure compliance with the Water Quality Standards and any Applicable Federal Standards.
- e. Discharges that the Board has determined to be or that may reasonably be expected to be contributing to a violation of Water Quality Standards or Applicable Federal Standards are not authorized by this Certification.

- f. The Board retains full authority provided by the Water Resources Ordinance to ensure compliance with and to enforce the provisions of the Water Resource Ordinance and Water Quality Standards, Applicable Federal Standards, and these Certification conditions.
- g. Appeals related to Board actions taken in accordance with any of the preceding conditions may be heard by the Grand Portage Tribal Court.

**9.3.2 WIR10I000 Indian country within the State of Wisconsin, except the Sokaogon Chippewa (Mole Lake) Community**

**9.3.2.1 Bad River Band of Lake Superior Tribe of Chippewa Indians:** The following conditions apply only to discharges on the Bad River Band of the Lake Superior Tribe of Chippewa Indians Reservation:

- a. Only those activities specifically authorized by the CGP are authorized by this Certification. This Certification does not authorize impacts to cultural properties, or historical sites, or properties that may be eligible for listing as such.<sup>61, 62</sup>
- b. Operators are not eligible to obtain authorization under the CGP for all new discharges to an Outstanding Tribal Resource Water (or Tier 3 water).<sup>63</sup> Outstanding Tribal Resource Waters, or Tier 3 waters, include the following: Kakagon Slough and the lower wetland reaches of its tributaries that support wild rice, Kakagon River, Bad River Slough, Honest John Lake, Bog Lake, a portion of Bad River, from where it enters the Reservation through the confluence with the White River, and Potato River.<sup>64</sup>
- c. Projects utilizing cationic treatment chemicals<sup>65</sup> within the Bad River Reservation boundaries are not eligible for coverage under the CGP.<sup>66</sup>
- d. All projects which are eligible for coverage under the CGP and are located within the exterior boundaries of the Bad River Reservation shall be implemented in such a manner that is consistent with the Tribe's Water Quality Standards (WQS).<sup>67</sup>
- e. An operator proposing to discharge to an Outstanding Resource Water (or Tier 2.5 water) under the CGP must comply with the antidegradation provisions of the Tribe's WQS. Outstanding Resource Waters, or Tier 2.5 waters, include the following: a portion of Bad River, from downstream the confluence with the White River to Lake Superior, White River, Marengo River, Graveyard Creek, Bear Trap Creek, Wood Creek, Brunsweller River, Tyler Forks, Bell Creek, and Vaughn Creek.<sup>68</sup> The antidegradation

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<sup>61</sup> Bad River Band of Lake Superior Tribe of Chippewa Indians Water Quality Standards adopted by Resolution No. 7-6-11-441 (hereafter, Tribe's WQS).

<sup>62</sup> 36 C.F.R. § 800.16(l)(2).

<sup>63</sup> Tribe's WQS: See provisions E.3.ii. and E.4.iv.

<sup>64</sup> Tribe's WQS: See provision E.2.iii.

<sup>65</sup> See definition of cationic treatment chemicals in Appendix A of the CGP.

<sup>66</sup> Tribe's WQS: See provisions E.6.ii.a. and E.6.ii.c.

<sup>67</sup> See footnote 61.

<sup>68</sup> Tribe's WQS: See provision E.2.ii.

demonstration materials described in provision E.4.iii. must be submitted to the following address:

Bad River Tribe's Natural Resources Department  
Attn: Water Resources Specialist  
P.O. Box 39  
Odanah, WI 54861

- f. An operator proposing to discharge to an Exceptional Resource Water (or Tier 2 water) under the CGP must comply with the antidegradation provisions of the Tribe's WQS. Exceptional Resource Waters, or Tier 2 waters, include the following: any surface water within the exterior boundaries of the Reservation that is not specifically classified as an Outstanding Resource Water (Tier 2.5 water) or an Outstanding Tribal Resource Water (Tier 3 water).<sup>69</sup> The antidegradation demonstration materials described in provision E.4.ii. must be submitted to the following address:

Bad River Tribe's Natural Resources Department  
Attn: Water Resources Specialist  
P.O. Box 39  
Odanah, WI 54861

- g. A discharge to a surface water within the Bad River Reservation boundaries shall not cause or contribute to an exceedance of the turbidity criterion included in the Tribe's WQS, which states: Turbidity shall not exceed 5 NTU over natural background turbidity when the background turbidity is 50 NTU or less, or turbidity shall not increase more than 10% when the background turbidity is more than 50 NTU.<sup>70</sup>
- h. All projects which are eligible for coverage under the CGP within the exterior boundaries of the Bad River Reservation must comply with the Bad River Reservation Wetland and Watercourse Protection Ordinance, or Chapter 323 of the Bad River Tribal Ordinances, including the erosion and sedimentation control, natural buffer, and stabilization requirements. Questions regarding Chapter 323 and requests for permit applications can be directed to the Wetlands Specialist in the Tribe's Natural Resources Department at (715) 682-7123 or [wetlands@badriver-nsn.gov](mailto:wetlands@badriver-nsn.gov).
- i. An operator of a project, which is eligible for coverage under the CGP, that would result in an allowable discharge under the CGP occurring within the exterior boundaries of the Bad River Reservation must notify the Tribe prior to the commencing earth-disturbing activities.<sup>71, 72</sup> The operator must submit a copy of the Notice of Intent (NOI) to the following addresses at the same time it is submitted to the U.S. EPA:

Bad River Tribe's Natural Resources Department  
Attn: Water Resources Specialist  
P.O. Box 39  
Odanah, WI 54861

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<sup>69</sup> Tribe's WQS: See provision E.2.i.

<sup>70</sup> Tribe's WQS: See provision E.7.iii.

<sup>71</sup> See footnote 61.

<sup>72</sup> See footnote 62.

Bad River Tribe's Natural Resources Department  
Attn: Tribal Historic Preservation Officer (THPO)  
P.O. Box 39  
Odanah, WI 54861

The operator must also submit a copy of the Notice of Termination (NOT) to the above addresses at the same time it is submitted to the U.S. EPA.

- j. The THPO must be provided 30 days to comment on the project.<sup>73</sup>
- k. The operator must obtain THPO concurrence in writing. This written concurrence will outline measures to be taken to prevent or mitigate effects to historic properties. For more information regarding the specifics of the cultural resources process, see 36 CFR Part 800. A best practice for an operator is to consult with the THPO during the planning stages of an undertaking.<sup>74</sup>
- l. An operator of a project, which is eligible for coverage under the CGP, that would result in an allowable discharge under the CGP occurring within the exterior boundaries of the Bad River Reservation must submit a copy of the Stormwater Pollution Prevention Plan (SWPPP) to the following address at the same time as submitting the NOI:<sup>75</sup>

Bad River Tribe's Natural Resources Department  
Attn: Water Resources Specialist  
P.O. Box 39  
Odanah, WI 54861

- m. Any corrective action reports that are required under the CGP must be submitted to the following address within one (1) working day of the report completion:<sup>76</sup>

Bad River Tribe's Natural Resources Department  
P.O. Box 39  
Odanah, WI 54861

- n. An operator shall be responsible for meeting any additional permit requirements imposed by the U.S. EPA necessary to comply with the Tribe's antidegradation policies if the discharge point is located upstream of waters designated by the Tribe.<sup>77</sup>

**9.3.2.2 Lac du Flambeau Band of Lake Superior Tribe of Chippewa Indians:** The following conditions apply only to discharges on the Lac du Flambeau Band of the Lake Superior Tribe of Chippewa Indians Reservation:

- a. A copy of the Stormwater Pollution Prevention Plan must be submitted to the following office, for the Traival environmental review process, at least thirty (30) days in advance of sending the Notice of Intent (NOI) to EPA:

Lac du Flambeau  
Tribal Land Management

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<sup>73</sup> 36 C.F.R. § 800.3(c)(4).

<sup>74</sup> 36 C.F.R. § 800.3(b).

<sup>75</sup> See footnote 61.

<sup>76</sup> See footnote 61.

<sup>77</sup> See footnote 61.

P.O. Box 279  
Lac du Flambeau, WI 54538

CGP applicants are encouraged to work with the LdF Water Resources Program in the identification of all proposed receiving waters.

- b. Copies of the NOI and the Notice of Termination (NOT) must be sent to the LdF Water Resources Program at the same time they are submitted to EPA.
- c. All work shall be carried out in such a manner as will prevent violations of water quality criteria as stated in the Water Quality Standards of the Lac du Flambeau Reservation. This includes, but is not limited to, the prevention of any discharge that cause a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of water of the Lac du Flambeau Reservation for any of the uses designated in the Water Quality Standards of the Lac du Flambeau Reservation.
- d. Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the Lac du Flambeau Reservation. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the Lac du Flambeau reservation, including groundwater.
- e. This certification does not authorize impacts to cultural, historical, or archeological features or sites, or properties that may be eligible for such listing.
- f. Due to the significant ecological and cultural importance of the Lac du Flambeau Reservation, any operator requesting a permit for a point source discharge of pollutants (i.e., discharge) associated with the Stormwater Discharge will need a stormwater pollution prevention plan in place that does not violate Lac du Flambeau Water Quality Standards to protect Reservation Waters.

#### 9.4 EPA REGION 6

##### 9.4.1 NMR100000 State of New Mexico, except Indian country

- a. If construction dewatering activities are anticipated at a site, permittees must complete the following steps:
  - i. Investigative information must be documented in the facility SWPPP.
  - ii. Refer to the GWQB Mapper at <https://gis.web.env.nm.gov/GWQB/> AND the PSTB Mapper (Go Mapper) at <https://gis.web.env.nm.gov/GoNM/> and check if the following sources are located within the noted distance from your anticipated construct site groundwater dewatering activity:

| <b>Project Location Relative to a Source of Potential Groundwater Contamination</b> | <b>Constituents likely to be required for testing</b>  |
|---|--|
| <i>Within 0.5 mile of an open Leaking Underground Storage Tank (LUST) site</i>      | <i>BTEX (Benzene, Toluene, Ethylbenzene, and Xylene) plus additional parameters depending on site conditions.*</i> |

| <b>Project Location Relative to a Source of Potential Groundwater Contamination</b>   | <b>Constituents likely to be required for testing</b>                                  |
|---|--|
| Within 0.5 mile of an open Voluntary Remediation site   | All parameters listed in Appendix A (or an alternate list approved by the NMED SWQB)** |
| Within 0.5 mile of an open RCRA Corrective Action Site  |  |
| Within 0.5 mile of an open Abatement Site   |  |
| Within 0.5 mile of an open Brownfield Site  |  |
| Within 1.0 mile or more of a Superfund site or National Priorities List (NPL) site with associated groundwater contamination. |  |

\*For further assistance determining whether dewatering may encounter impacted groundwater, the permittee may contact the NMED Ground Water Quality Bureau at: 505-827-2965.

\*\*EPA approved-sufficiently sensitive methods must be used - approved methods are listed in 40 CFR Part 136.3.

- iii. If dewatering activities are anticipated, information on flow and potential to encounter impacted groundwater must be provided directly to NMED at the following address:

Program Manager, Point Source Regulation Section  
NMED Surface Water Quality Bureau  
PO Box 5469, Santa Fe, NM 87502

Information may also be emailed - the contact information for the program manager is located on the website at: [www.env.nm.gov/swqb/PSR](http://www.env.nm.gov/swqb/PSR).

- iv. Permittee must test the quality of the water being considered for discharge. Permittees must contact the Point Source Regulation Section Program Manager for information on constituents that must be monitored.
  - v. Permittee must send test result data to EPA Region 6 and the NMED Surface Water Quality Bureau. If the test data exceed standards, it cannot be discharged from the construction site into surface waters under this permit. Discharge to surface waters must be conducted under a separate NPDES individual permit to ensure proper treatment and disposal.
  - vi. If disposal will be to the ground surface or in an unlined pond, the permittee must submit an NOI/ to the NMED Ground Water Quality Bureau.
- b. Operators are not eligible to obtain authorization under this permit for all new and existing storm water discharges to outstanding national resource waters (ONRWs) (also referred to as "Tier 3" waters.)
    - i. Although state WQS provide for temporary and short-term degradation of water quality in an ONRW under very limited circumstances if approved by the Water Quality Control Commission as specified at 20.6.4.8.A NMAC, the approval process required for these activities does not lend itself for use for projects covered under this general permit. This condition is necessary to ensure that no degradation is allowed in ONRWs by requiring proposed storm water discharges to be reviewed under the individual permit process. Tier 3 waters are defined in Appendix F of the proposed permit.



- c. Operators who intend to obtain authorization under this permit for new and existing storm water discharges from construction sites must satisfy the following condition: The SWPPP must include site-specific interim and permanent stabilization, managerial, and structural solids, erosion and sediment control best management practices (BMPs) and/or other controls that are designed to prevent to the maximum extent practicable an increase in the sediment yield and flow velocity from pre-construction, pre-development conditions to assure that applicable standards in 20.6.4.NMAC, including the antidegradation policy, or TMDL waste load allocations (WLAs) are met. This requirement applies to discharges both during construction and after construction operations have been completed. The SWPPP must identify and document the rationale for selecting these BMPs and/or other controls. The SWPPP must also describe design specifications, construction specifications, maintenance schedules (including a long term maintenance plan), criteria for inspections, and expected performance and longevity of these BMPs. For sites greater than 5 acres in size, BMP selection must be made based on the use of appropriate soil loss prediction models (i.e. SEDCAD, RUSLE, SEDIMOT, MULTISED, etc.) OR equivalent generally accepted (by professional erosion control specialists) soil loss prediction tools.
  - i. For all sites, the operator(s) must demonstrate, and include documentation in the SWPPP, that implementation of the site-specific practices will assure that the applicable standards or TMDL WLAs are met, and will result in sediment yields and flow velocities that, to the maximum extent practicable, will not be greater than the sediment yield levels and flow velocities from preconstruction, pre-development conditions.
  - ii. All SWPPPs must be prepared in accordance with good engineering practices by qualified (e.g. CPESC certified, engineers with appropriate training) erosion control specialists familiar with the use of soil loss prediction models and design of erosion and sediment control systems based on these models (or equivalent soil loss prediction tools). Qualifications of the preparer (e.g., professional certifications, description of appropriate training) must be documented in the SWPPP. The operator(s) must design, implement, and maintain BMPs in the manner specified in the SWPPP.
- d. State regulations at 20.6.2.1203 NMAC state: *With respect to any discharge from any facility of oil or other water contaminant, in such quantity as may with reasonable probability injure or be detrimental to human health, animal or plant life, or property, or unreasonably interfere with the public welfare or the use of property, the following notifications and corrective actions are required:*
  - i. As soon as possible after learning of such a discharge, but in no event more than twenty-four (24) hours thereafter, any person in charge of the facility shall orally notify the Chief of the Ground Water Quality Bureau of the department, or his counterpart in any constituent agency delegated responsibility for enforcement of these rules as to any facility subject to such delegation.

Permittees can call 505-827-9329 for emergencies at any time and 505-476-6000 for non-emergencies during business hours from 5am-5pm, Monday through Friday.

- e. NMED does not allow permittees to use the Equivalent Analysis Waiver.

**9.4.2 NMR10I000 Indian country within the State of New Mexico, except Navajo Reservation Lands that are covered under Arizona permit AZR10000I and Ute Mountain Reservation Lands that are covered under Colorado permit COR10000I.**

**9.4.2.1 Pueblo of Isleta.** The following conditions apply only to discharges on the Pueblo of Isleta Reservation:

- a. CGP at 1.3 Prohibited discharges: Stormwater discharges associated with construction activity that EPA or the Pueblo of Isleta, prior to authorization under this permit, determines will cause, have the reasonable potential to cause, or may reasonably be expected to contribute to a violation or excursion of any applicable water quality standard, including the antidegradation policy, or the impairment of a designated use of receiving waters are not authorized by this permit.
- b. CGP at 1.4.1 How to Submit Your NOI: The operator shall provide a copy of the Notice of Intent ("NOI") to the Pueblo of Isleta at the same time it is submitted to the U.S. Environmental Protection Agency, for projects occurring within the exterior boundaries of the Pueblo of Isleta. The operator shall also notify the Pueblo of Isleta when it has submitted the Notice of Termination ("NOT"). The NOI and NOT shall be sent to the Pueblo of Isleta at the following address:

Water Quality Control Officer  
Pueblo of Isleta  
Environment Division  
PO Box 1270  
Isleta, NM 87022  
(505) 869-7565  
E-mail: [POI36871@isletapueblo.com](mailto:POI36871@isletapueblo.com)

Overnight/Express Mail Delivery  
Pueblo of Isleta  
Environment Division  
6 Sagebrush St.  
Albuquerque, NM 87105

- c. CGP at 1.5 Requirement to post a notice of your permit coverage: Amend to read: "You must post a sign or other notice of your permit coverage at a safe, publicly accessible location in close proximity to the construction site. The notice must be located so that it is visible from the public road or tribal road that is nearest to the active part of the construction site..."
- d. CGP at 7.2.6 Description of stormwater controls: The SWPPP will be considered to be incomplete if the operator has not coordinated requirements under this Part with the Pueblo of Isleta Public Services Department.
- e. CGP I.12.6.1 at pg.I-6 of 8. The Pueblo of Isleta requests notification within 10 hours (rather than 24 hrs.) if health or the environment become endangered.
- f. CGP at I.12.2 Anticipated noncompliance: Amend to read: "You must give advance notice to EPA and the Pueblo of Isleta at the address indicated in 1.4.1 (a) of any planned changes in the permitted facility or activity which may results in noncompliance with permit requirements."
- g. CGP at I.12.6.1: Any noncompliance for projects within the exterior boundaries of the Pueblo of Isleta which may endanger health or the environment shall be reported directly to the EPA Regional Office [(see contacts at <https://www.epa.gov/npdес/contact-us-stormwater#regional>)] and to the Pueblo of Isleta Water Quality Control Officer. Any information must be provided orally with n 12 hours of the time you become aware of the circumstances. Other requirements of

this Part for a written submission apply. Electronic communication (E-mail) shall be provided as soon as practical. Verbal notice shall be provided to:

Water Quality Control Officer  
Pueblo of Isleta  
E-mail: [POI36871@isletapueblo.com](mailto:POI36871@isletapueblo.com)  
(505) 869-7565  
(505) 263-5425 cellular  
(505) 869-3030 Police Dispatch

- h. CGP at 2.2 Erosion and sediment control requirements: Erosion and sediment controls shall be designed to retain sediment on-site.
- i. CGP at 2.2 Under Sediment control requirements, Standard Permit Condition Duty to Mitigate Volumes of sediment at or over (five) 5 cubic yards must be removed and placed for disposal within a tribally approved sediment Disposal Site, located on Pueblo of Isleta lands. CGP 2.2 at pg. 8.
- j. Under Minimize erosion, a permittee must secure permission from the Pueblo or affected Pueblo of Isleta land assignment owner if a dissipation device needs to be placed up- or down- elevation of a given construction site. CGP 2.2.11 at pg. 11.
- k. CGP at 2.3.6 Emergency spill notification requirements: You must notify the Pueblo of Isleta Water Quality Control Officer and National Response Center (NRC) [at (800) 424-8802 or, in the Washington, DC metropolitan area, call (202) 267-2675 in accordance with the requirements of 40 CFR 110, 40 CFR 117, and 40 CFR 302] as soon as you have knowledge of the release. Verbal and electronic notice shall be provided as specified in I.12.6.1
- l. CGP at C.3 Equivalent analysis waiver: Parties wishing to apply for an Equivalent Analysis Waiver (see Appendix D, Section C) must provide a copy of the waiver analysis to the Pueblo of Isleta Water Quality Control Officer at the address indicated in 1.4.1 (a).

**9.4.2.2 Pueblo of Sandia.** The following conditions apply only to discharges on the Pueblo of Sandia Reservation:

- a. Only those activities specifically authorized by the CGP are authorized by the Pueblo of Sandia's Water Quality certification. The Pueblo of Sandia's Water Quality Certification does not authorize impact to cultural properties, historical sites or properties that may be eligible as such.
- b. Copies of all Notices of Intent (NOI) submitted to the EPA must also be sent concurrently to the Pueblo of Sandia at the following address. Discharges are not authorized by this permit unless an accurate and complete NOI has been submitted to the Pueblo of Sandia, either by mail or electronically.

Regular U.S. Delivery Mail:  
Pueblo of Sandia Environment Department  
Attention: Scott Bulgrin, Water Quality Manager  
481 Sandia Loop  
Bernalillo, New Mexico 87004

Electronically:  
[sbulgrin@sandiapueblo.nsn.us](mailto:sbulgrin@sandiapueblo.nsn.us)

- c. Any correspondences between the applicant and EPA related to analytical data, written reports, corrective action, enforcement, monitoring, or an adverse incident written reports should likewise be routed to the Pueblo of Sandia at the above address.
- d. The Stormwater Pollution Prevention Plan (SWPPP) must be available to the Pueblo of Sandia Environment Department either electronically or hard copy upon request for review. The SWPPP must be made available at least fourteen (14) days before construction begins. The fourteen (14) day period will give Pueblo staff time to become familiar with the project site, prepare for construction site inspections, and determine compliance with the Pueblo of Sandia Water Quality Standards. Failure to provide a SWPPP to the Pueblo of Sandia may result in the delay or denial of the construction project.
- e. If requested by the Pueblo of Sandia Environment Department, the permittee must provide additional information necessary for a case-by-case eligibility determination to assure compliance with the Pueblo of Sandia Water Quality Standards and/or applicable Federal Standards not authorized by this certification.
- f. An "Authorization to Proceed Letter" with site specific mitigation requirements may be sent out to the permittee when a review of the NOI and SWPPP, on a case-by-case basis is completed by the Pueblo of Sandia Environment Department. This approval will allow the application to proceed if all mitigation requirements are met.
- g. The Pueblo of Sandia will not allow Small construction Waivers (Appendix C) or the Rainfall Erosivity Waiver (Appendix C.1) to be granted for any small construction activities.
- h. Before submitting a Notice of Termination (NOT) to the EPA, permittees must clearly demonstrate to the Pueblo of Sandia Environment Department through a site visit or documentation that requirements for site stabilization have been met and any temporary erosion control structures have been removed. A short letter stating the NOT is acceptable and all requirements have been met will be sent to the permittee to add to the permittee's NOT submission to EPA.
- i. Copies of all NOT submitted to the EPA must also be sent concurrently to the Pueblo of Sandia through the mail or electronically.

Regular U.S. Delivery Mail:

Pueblo of Sandia Environment Department  
Attention: Scott Bulgrin, Water Quality Manager 481 Sandia Loop  
Bernalillo, New Mexico 87004

Electronically:

[sbulgrin@sandiapueblo.nsn.us](mailto:sbulgrin@sandiapueblo.nsn.us)

- j. The Pueblo of Sandia may require the permittee to perform water quality monitoring for pH, turbidity, and total suspended solids (TSS) during the permit term if the discharge is to a surface water leading to the Rio Grande for the protection of public health and the environment.

**9.4.2.3 Pueblo of Santa Ana.** The following conditions apply only to discharges on the Pueblo of Santa Ana Reservation:

- a. The operator shall provide a copy of the Notice of Intent (NOI) to the Pueblo of Santa Ana (the Pueblo), at the same time it is submitted to the U.S. Environmental Protection Agency (EPA), for projects with discharges onto the lands of the Pueblo as defined in the Pueblo of Santa Ana Water Quality Standards.

- b. The operator shall provide a copy of the Stormwater Pollution Prevention Plan (SWPPP), at the same time that an NOI is submitted to the EPA, to the Pueblo for projects with discharges onto the lands of the Pueblo as defined in the Pueblo of Santa Ana Water Quality Standards.
- c. The operator shall provide a copy of the SWPPP, copies of inspections reports, and copies of corrective action reports to the Pueblo at the address below for review, upon request.
- d. The NOI, SWPPP and Notice of Termination (NOT) shall be sent to the Pueblo at the following address:

Pueblo of Santa Ana Department of Natural Resources,  
Attention: Water Quality Program Specialist  
2 Dove Road  
Santa Ana Pueblo, NM, 87004
- e. Discharges are not authorized by this permit unless an accurate and complete NOI and SWPPP have been submitted to the Pueblo. Failure to provide an accurate and complete NOI and SWPPP may result in a denial of the discharge permit or groundbreaking or construction delay.
- f. The operator will not proceed with site work until authorized by the Pueblo. The Pueblo requires review of the complete and final SWPPP by the Pueblo before authorization to proceed. The Pueblo will provide an "authorization to proceed" notice after review and approval of the SWPPP.
- g. Before submitting a NOT, permittees must certify to the Pueblo's Department of Natural Resources in writing that requirements for site stabilization have been met, and any temporary erosion control structures have been removed. Documentation of the Pueblo's review that such requirements have been reviewed and met will be provided for the permittee to add to the permittee's NOT submission to EPA. Copies of all NOT submitted to the EPA must also be sent to the Pueblo at the address provided above.

**9.4.2.4 Pueblo of Santa Clara.** The following conditions apply only to discharges on the Pueblo of Santa Clara Reservation:

- a. The operator must provide a copy of the Notice of Intent (NOI) and Notice of Termination (NOT) to the Santa Clara Pueblo Governor's Office at the same time it is provided to the US Environmental Protection Agency.
- b. A copy of the Storm water Pollution Prevention Plan shall be made available to the Pueblo of Santa Clara staff upon request.

**9.4.2.5 Pueblo of Tesuque.** The following conditions apply only to discharges on the Pueblo of Tesuque Reservation:

- a. The operator shall provide a copy of the Notice of Intent (NOI) to the Pueblo of Tesuque Governor's Office and Environment Department at same time it is submitted to the Environmental Protection Agency, for projects occurring within the exterior boundaries of our tribal lands. The operator shall also notify the Pueblo of Tesuque Governor's Office and Environment Department when it submitted the Notice of Termination. The NOI and NOT shall be sent to the Pueblo of Tesuque Governor's Office and Environment Department at the following address:

Pueblo of Tesuque  
Office of the Governor  
Route 42 Box 360-T  
Santa Fe, NM 87506 or  
email: [governor@pueblooftesuque.org](mailto:governor@pueblooftesuque.org)

- b. The operator shall also provide a copy of the Stormwater Pollution Prevention Plan, copies of inspections reports, and copies of corrective action reports to staff in the Pueblo of Tesuque Environment Department.

**9.4.2.6 Taos Pueblo.** The following conditions apply only to discharges on the Taos Pueblo Reservation:

- a. The operator shall provide a copy of the Notice of Intent (NOI) to the Taos Pueblo Governor's Office, War Chief's Office and Environmental Office, at the same time it is submitted to the U.S. Environmental Protection Agency, for projects occurring within the exterior boundaries of Taos Pueblo. The operator shall also notify Taos Pueblo when it has submitted the Notice of Termination (NOT). The NOI and NOT shall be sent to the Taos Pueblo at the following addresses:
  - i. Taos Pueblo Governor's Office  
P.O. Box 1846  
Taos NM 87571
  - ii. Taos Pueblo War Chief's Office  
P.O. Box 2596  
Taos NM 87571
  - iii. Environmental Office  
Attn: Program Manger  
P.O. Box 1846  
Taos NM 87571
- b. Taos Pueblo requests that in the event Indian artifacts or human remains are inadvertently discovered on projects occurring near or on Taos Pueblo lands that consultation with the tribal Governor's Office occur at the earliest possible time.
- c. The operator shall provide a copy of the Stormwater Pollution Prevention Plan, copies of inspections reports, and copies of corrective action reports to staff in the Taos Pueblo Environmental Office for review and copy, upon request.

**9.4.2.7 Ohkay Owingeh.** The following conditions apply only to discharges on the Ohkay Owingeh Reservation:

- a. Prior to commencement of any construction activity on Ohkay Owingeh Lands requiring permit coverage under EPA's Construction General Permit, the operator(s) shall submit to Ohkay Owingeh Office of Environmental Affairs, a copy of the electronic "Notice of Intent," submitted to the Environmental Protection Agency, immediately following EPA's electronic notification that the NOI has been received. A copy of the Stormwater Pollution Prevention Plan(s) must be made available to the Ohkay Owingeh Office of Environmental Affairs upon the tribe's request either electronically or hard copy. Operator(s) shall also submit to Ohkay Owingeh Office of Environmental Affairs a copy of the electronic Notice of Termination (NOT) submitted to the Environmental Protection Agency. Documents shall be submitted to Ohkay Owingeh at the following address:

Ohkay Owingeh Office of Environment Affairs  
Attention: Environmental Programs Manager  
P.O. Box 717  
Ohkay Owingeh, New Mexico 87566  
Office # 505.852.4212  
Fax # 505.852.1432  
Electronic mail: [naomi.archuleta@ohkay.org](mailto:naomi.archuleta@ohkay.org)

- b. Ohkay Owingeh will not allow the Rainfall Erosivity Waivers (see Appendix C) to be granted for any small construction activities.
- c. All vegetation used to prevent soil loss, seeding or planting of the disturbed area(s) to meet the vegetative stabilization requirements must utilize native seeds/vegetation commonly known to the area. All temporary erosion control structures, such as silt fences must be removed as soon as stabilization requirements are met.

**9.4.3 OKR10I000 Indian country within the State of Oklahoma**

**9.4.3.1 Pawnee Nation.** The following conditions apply only to discharges within Pawnee Indian country:

- a. Copies of the Notice of Intent (NOI) and Notice of Termination (NOT) must be provided to the Pawnee Nation at the same time it is submitted to the Environmental Protection Agency to the following address:

Pawnee Nation Department of Environmental Conservation and Safety  
P.O. Box 470  
Pawnee, OK 74058  
Or email to [mmatlock@pawneenation.org](mailto:mmatlock@pawneenation.org)

- b. The Storm Water Pollution Prevention Plan must be available to Departmental inspectors upon request.
- c. The Department must be notified at 918.762.3655 immediately upon discovery of any noncompliance with any provision of the permit conditions.

**9.4.4 OKR10F000 Discharges in the State of Oklahoma that are not under the authority of the Oklahoma Department of Environmental Quality, including activities associated with oil and gas exploration, drilling, operations, and pipelines (includes SIC Groups 13 and 46, and SIC codes 492 and 5171), and point source discharges associated with agricultural production, services, and silviculture (includes SIC Groups 01, 02, 07, 08, 09).**

- a. For activities located within the watershed of any Oklahoma Scenic River, including the Illinois River, Flint Creek, Barren Fork Creek, Upper Mountain Fork, Little Lee Creek, and Lee Creek or any water or watershed designated "ORW" in Oklahoma's Water Quality Standards, this permit may only be used to authorize discharges from temporary construction activities. Certification is denied for any on-going activities such as sand and gravel mining or any other mineral mining.
- b. For activities located within the watershed of any Oklahoma Scenic River, including the Illinois River, Flint Creek, Barren Fork Creek, Upper Mountain Fork, Little Lee Creek, and Lee Creek or any water or watershed designated "ORW" in Oklahoma's Water Quality Standards, certification is denied for any discharges originating from support activities, including concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, or borrow areas.

- c. In order to comply with Oklahoma's Water Quality Standards, these conditions and restrictions also apply to any construction projects located wholly or partially on Indian Country lands within the State of Oklahoma.

## **9.5 EPA REGION 8**

### **9.5.1 MTR10I000 Indian country within the State of Montana**

#### **9.5.1.1 The Confederated Salish and Kootenai Tribes of the Flathead Nation.** The following conditions apply only to discharges on the Confederated Salish and Kootenai Tribes of the Flathead Nation Reservation:

- a. Permittees must submit the Stormwater Pollution Prevention Plan (SWPPP) to the Confederated Salish and Kootenai Tribes at least 30 days before construction starts.
- b. Before submitting the Notice of Termination (NOT), permittees must clearly demonstrate to an appointed Tribal staff person during an onsite inspection that requirements for site stabilization have been met.
- c. The permittee must send a copy of the Notice of Intent (NOI) and the NOT to CSKT.
- d. Permittees may submit their SWPPPs, NOIs and NOTs electronically to: [clintf@cskt.org](mailto:clintf@cskt.org).
- e. Written SWPPPs, NOIs and NOTs may be mailed to:

Clint Folden, Water Quality Regulatory Specialist  
Confederated Salish and Kootenai Tribes  
Natural Resources Department  
P.O. Box 278  
Pablo, MT 59855

## **9.6 EPA REGION 9**

### **9.6.1 CAR10I000 Indian country within the State of California**

#### **9.6.1.1 Twenty-Nine Palms Band of Mission Indians.** The following conditions apply only to discharges on the Twenty-Nine Palms Band of Mission Indians Reservation:

- a. At the time the applicant submits its Notice of Intent (NOI) to the EPA, the applicant must concurrently submit written notification of the NOI and a copy of the Stormwater Pollution Prevention Plan (SWPPP) to the Twenty-Nine Palms Band of Mission Indians at the address below:

Tribal Environmental Coordinator  
Twenty-Nine Palms Band of Mission Indians  
46-200 Harrison Place  
Coachella, CA 92236
- b. The applicant must also concurrently submit to the Tribal Environmental Coordinator written notification of any other forms or information submitted to the EPA, including waivers, reporting, and Notice of Termination (NOT).
- c. Permitted entities under the CGP must keep the Tribal EPA informed of authorized discharges under the CGP by submitting written information about the type, quantity, frequency and location, intended purpose, and potential human health and/or environmental effects of their activities. These requirements are pursuant to Section 4 of the Twenty-Nine Palms Band of Mission Indians Water Pollution Control Ordinance (022405A). This information may be submitted to Tribal EPA in the form of Stormwater Pollution Prevention Plans (SWPPPs), monitoring reports, or other reports as required



under the CGP. Spills, leaks, or unpermitted discharges must be reported in writing to Tribal EPA within 24 hours of the incident.

**9.6.2 GUR100000 Island of Guam.** The following conditions apply only to discharges on the Island of Guam:

- a. Any earth-moving operations which require a permit must be obtained from the Department of Public Works (DPW) with clearance approval from various Government of Guam Agencies including Guam EPA prior to the start of any earth-moving activity.
- b. In the event that the construction sites are within the Guam Sole Source Aquifer, the construction site owner and operator must consider opportunities to facilitate groundwater recharge for construction and post-construction implementing infiltration Best Management Practices. Stormwater disposal systems shall be designed and operated within the boundaries of the project. Stormwater systems shall not be permitted within any Wellhead Protection Zone unless the discharge meets the Guam Water Quality Standards within the zone. Waters discharged within the identified category G-2 recharge zone shall receive treatment to the degree required to protect the drinking water quality prior to it entering the category G-1 resource zone.
- c. All conditions and requirements set forth in the 22 Guam Administrative Rules and Regulations (GARR), Division II, Water Control, Chapter 10, Guam Soil Erosion and Sediment Control Regulations (GSESCR) that are more protective than the CGP regarding construction activities must be complied with.
- d. All standards and requirements set forth in the 22 GARR, Division II, Water Control, Chapter 5, *Guam Water Quality Standards (GWQS) 2001 Revisions*, must be complied with to include reporting GWQS exceedance to Guam EPA.
- e. All operators/owners of any property development or earth moving activities shall comply with the erosion control pre-construction and post-construction BMP design performance standards and criteria set forth in the 2006 CNMI and Guam Stormwater Management Manual.
- f. All conditions and requirements regarding dewatering activities set forth in 22 Guam Administrative Rules and Regulations Chapter 7, Water Resources Development and Operating Regulations must be complied with to include securing permits with Guam EPA prior to the start of any dewatering activities.
- g. If a project to be developed is covered under the Federal Stormwater Regulations (40 CFR Parts 122 & 123), a Notice of Intent (NOI) to discharge stormwater to the surface and marine waters of Guam must be submitted to the U.S. EPA and a copy furnished to Guam EPA, pursuant to Section 10, 104(B)(5)(d) 22GAR, Division II, Chapter 10.
- h. Guam EPA shall apply the Buffer Requirements listed in Appendix G of the CGP NPDES Permit for construction activities as it pertains to Waters of the U.S. in Guam. Guam EPA shall also apply the same buffer requirements for sinkholes in Guam.
- i. When Guam EPA, through its permit review process, identifies that the proposed construction activity is close proximity to marine waters, contractors and owners will be informed that any activity that may impair water quality are required to stop

during peak coral spawning periods as per the Guam Coral Spawning Construction Moratoriums.

- j. The Proposed Construction General Permit must set appropriate measures and conditions to protect Guam's Threatened and Endangered Species and Outstanding Resource Waters of exceptional recreational or ecological significance as determined by the Guam EPA Administrator as per *Guam Water Quality Standards 2001 Revisions*, §5102, Categories of Waters, D. Outstanding Resource Waters.
- k. When Guam EPA through its permit review process identifies that proposed construction activity is in close proximity to any Section 303d impaired waters, which includes marine waters and surface waters, shall ensure that construction activity does not increase the impaired water's ambient parameters.
- l. When Rainfall Erosivity and TMDL Waivers reflected in the CGP, Appendix C, are submitted to the U.S. EPA, Guam EPA will review waivers on a project by project basis.
- m. Prior to submission of the Notice of Termination (NOT) to the U.S. EPA, permittees must clearly demonstrate to Guam EPA that the project site has met all soil stabilization requirements and removal of any temporary erosion control as outlined in the GSESCR.

## **9.7 EPA REGION 10**

### **9.7.1 IDR100000 State of Idaho, except Indian country**

- a. Idaho's Antidegradation Policy. The WQS contain an antidegradation policy providing three levels of protection to water bodies in Idaho (IDAPA 58.01.02.051).
  - 1. Tier I Protection. The first level of protection applies to all water bodies subject to Clean Water Act jurisdiction and ensures that existing uses of a water body and the level of water quality necessary to protect those existing uses will be maintained and protected (IDAPA 58.01.02.051.01; 58.01.02.052.01). Additionally, a Tier I review is performed for all new or reissued permits or licenses (IDAPA 58.01.02.052.05).
  - 2. Tier II Protection. The second level of protection applies to those water bodies considered high quality and ensures that no lowering of water quality will be allowed unless deemed necessary to accommodate important economic or social development (IDAPA 58.01.02.051.02; 58.01.02.052.08).
  - 3. Tier III Protection. The third level of protection applies to water bodies that have been designated outstanding resource waters and requires that activities not cause a lowering of water quality (IDAPA 58.01.02.051.03; 58.01.02.052.09).

DEQ is employing a water body by water body approach to implementing Idaho's antidegradation policy. This approach means that any water body fully supporting its beneficial uses will be considered high quality (IDAPA 58.01.02.052.05.a). Any water body not fully supporting its beneficial uses will be provided Tier I protection for that use, unless specific circumstances warranting Tier II protection are met (IDAPA 58.01.02.052.05.c). The most recent federally approved Integrated Report and supporting data are used to determine support status and the tier of protection (IDAPA 58.01.02.052.05).
- b. Pollutants of Concern. The primary pollutants of concern associated with stormwater discharges from construction activities are sediment, typically measured as total suspended solids and turbidity. Other potential pollutants include the following:

phosphorus, nitrogen, pesticides, organics, metals, PCBs, petroleum products, construction chemicals, and solid wastes.

- c. Receiving Water Body Level of Protection. The CGP provides coverage to construction activities throughout the entire State of Idaho. Because of the statewide applicability, all of the jurisdictional waters within Idaho could potentially receive discharges either directly or indirectly from activities covered under the CGP. DEQ applies a water body by water body approach to determine the level of antidegradation a water body will receive.

All waters in Idaho that receive discharges from activities authorized under the CGP will receive, at minimum Tier I antidegradation protection because Idaho's antidegradation policy applies to all waters of the state. Water bodies that fully support their aquatic life or recreational uses are considered to be *high quality waters* and will receive Tier II antidegradation protection.

Although Idaho does not currently have any Tier III designated outstanding resource waters (ORWs) designated, it is possible for a water body to be designated as an ORW during the life of the CGP. Because of this potential, the antidegradation review also assesses whether the permit complies with the outstanding resource water requirements of Idaho's antidegradation policy.

To determine the support status of the receiving water body, persons filing a Notice of Intent (NOI) for coverage under this general permit must use the most recent EPA-approved Integrated Report, available on Idaho DEQ's website:

<http://www.deq.idaho.gov/water-quality/surface-water/monitoring-assessment/integrated-report/>.

High quality waters are identified in Categories 1 and 2 of the Integrated Report. If a water body is in either Category 1 or 2, it is a Tier II water body.

Unassessed waters are identified as Category 3 of DEQ's Integrated Report. These waters require a case-by-case determination to be made by DEQ based on available information at the time of the application for permit coverage. If a water body is unassessed, the applicant is directed to contact DEQ for assistance in filing the NOI.

Impaired waters are identified in Categories 4 and 5 of the Integrated Report. Category 4(a) contains impaired waters for which a TMDL has been approved by EPA. Category 4(b) contains impaired waters for which controls other than a TMDL have been approved by EPA. Category 5 contains waters which have been identified as "impaired," for which a TMDL is needed. These waters are Tier I waters, for the use which is impaired. With the exception, if the aquatic life uses are impaired for any of these three pollutants—dissolved oxygen, pH, or temperature—and the biological or aquatic habitat parameters show a health, balanced biological community, then the water body shall receive Tier II protection, in addition to Tier I protection, for aquatic life uses (IDAPA 58.01.02.052.05.c.i.).

DEQ's webpage also has a link to the state's map-based Integrated Report which presents information from the Integrated Report in a searchable, map-based format: <http://www.deq.idaho.gov/assistance-resources/maps-data/>.

Water bodies can be in multiple categories for different causes. If assistance is needed in using these tools, or if additional information/clarification regarding the

support status of the receiving water body is desired, the operator is directed to make contact with the appropriate DEQ regional office of the State office in the table below:

| Regional and State Office | Address   | Phone Number | Email  |
|---------------------------|---|--------------|--|
| Boise                     | 1445 N. Orchard Rd.,<br>Boise 83706               | 208-373-0550 | <a href="mailto:Kati.carberry@deq.idaho.gov">Kati.carberry@deq.idaho.gov</a>           |
| Coeur d'Alene             | 2110 Ironwood Parkway,<br>Coeur D'Alene 83814     | 208-769-1422 | <a href="mailto:June.bergquist@deq.idaho.gov">June.bergquist@deq.idaho.gov</a>         |
| Idaho Falls               | 900 N. Skyline, Suite B., Idaho Falls 83402       | 208-528-2650 | <a href="mailto:Troy.saffle@deq.idaho.gov">Troy.saffle@deq.idaho.gov</a>               |
| Lewiston                  | 1118 "F" St., Lewiston 83501                      | 208-799-4370 | <a href="mailto:Mark.sellet@deq.idaho.gov">Mark.sellet@deq.idaho.gov</a>               |
| Pocatello                 | 444 Hospital way, #300 Pocatello 83201            | 208-236-6160 | <a href="mailto:Lynn.vanevery@deq.idaho.gov">Lynn.vanevery@deq.idaho.gov</a>           |
| Twin Falls                | 650 Addison Ave., W., Suite 110, Twin Falls 83301 | 208-736-2190 | <a href="mailto:Balthasar.buhidar@deq.idaho.gov">Balthasar.buhidar@deq.idaho.gov</a>   |
| State Office              | 1410 N. Hilton Rd., Boise 83706                   | 208-373-0502 | <a href="mailto:Nicole.deinarowicz@deq.idaho.gov">Nicole.deinarowicz@deq.idaho.gov</a> |

- d. *Turbidity Monitoring.* The permittee must conduct turbidity monitoring during construction activities and thereafter on days where there is a direct discharge of pollutants from an unstabilized portion of the site which is causing a visible plume to a water of the U.S.

A properly and regularly calibrated turbidimeter is required for measurements analyzed in the field (preferred method), but grab samples may be collected and taken to a laboratory for analysis. If the permittee can demonstrate that there will be no direct discharge from the construction site, then turbidity monitoring is not required. When monitoring is required, a sample must be taken at an undisturbed area immediately upstream of the project area to establish background turbidity levels for the monitoring event. Background turbidity, location, date and time must be recorded prior to monitoring downstream of the project area. A sample must also be taken immediately downstream from any point of discharge and *within* any visible plume. The turbidity, location, date and time must be recorded. The downstream sample must be taken immediately following the upstream sample in order to obtain meaningful and representative results.

Results from the compliance point sampling or observation<sup>78</sup> must be compared to the background levels to determine whether project activities are causing an exceedance of state WQS. If the downstream turbidity is 50 NTUs or more than the upstream turbidity, then the project is causing an exceedance of WQS. *Any exceedance of the turbidity standard must be reporting to the appropriate DEQ regional office within 24 hours. The following six (6) steps should be followed to ensure compliance with the turbidity standard:*

1. If a visible plume is observed, quantify the plume by collecting turbidity measurements from within the plume and compare the results to Idaho's instantaneous numeric turbidity criterion (50 NTU over the background).
2. If turbidity is less than 50 NTU instantaneously over the background turbidity; continue monitoring as long as the plume is visible. If turbidity exceeds background turbidity by more than 50 NTU instantaneously then stop all earth disturbing construction activities and proceed to step 3.
3. Take immediate action to address the cause of the exceedance. That may include inspection the condition of project BMPs. If the BMPs are functioning to their fullest capability, then the permittee must modify project activities and/or BMPs to correct the exceedance.
4. Notify the appropriate DEQ regional office within 24 hours.
5. Possibly increase monitoring frequency until state water quality standards are met.
6. Continue earth disturbing construction activities once turbidity readings return to within 50 NTU instantaneously and 25 NTU for more than ten consecutive days over the background turbidity.

Copies of daily logs for turbidity monitoring must be available to DEQ upon request. The report must describe all exceedances and subsequent actions taken, including the effectiveness of the action.

- e. Reporting of Discharges Containing Hazardous Materials or Petroleum Products. All spills of hazardous material, deleterious material or petroleum products which may impact waters (ground and surface) of the state shall be immediately reported. Call 911 if immediate assistance is required to control, contain or clean up the spill. If no assistance is needed in cleaning up the spill, contact the appropriate DEQ regional office in the table below during normal working hours or Idaho State Communications Center after normal working hours. If the spilled volume is above federal reportable quantities, contact the National Repose Center.

For immediate assistance: Call 911

National Response Center: (800) 424-8802

Idaho State Communications Center: (800) 632-8000

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<sup>78</sup> A visual observation is only acceptable to determine whether BMPs are functioning properly. If a plume is observed, the project may be causing an exceedance of WQS and the permittee must collect turbidity data and inspect the condition of the projects BMPs. If the BMPs appear to be functioning to their fullest capability and the turbidity is 50 NTUs or more than the upstream turbidity, then the permittee must modify the activity or implement additional BMPs (this may also include modifying existing BMPs).

| Regional office | Toll Free Phone Number | Phone Number |
|-----------------|------------------------|--------------|
| Boise           | 888-800-3480           | 208-373-0550 |
| Coeur d'Alene   | 877-370-0017           | 208-769-1422 |
| Idaho Falls     | 800-232-4635           | 208-528-2650 |
| Lewiston        | 977-547-3304           | 208-799-4370 |
| Pocatello       | 888-655-6160           | 208-236-6160 |
| Twin Falls      | 800-270-1663           | 208-736-2190 |

**9.7.2 IDR10I000 Indian country within the State of Idaho, except Duck Valley Reservation lands (see Region 9)**

**9.7.2.1 Shoshone-Bannock Tribes.** The following conditions apply only to discharges on the Shoshone-Bannock Reservation:

- f. Each operator shall submit a signed hard copy of the Notice of Intent (NOI) to the Shoshone-Bannock Tribes Water Resources Department at the same time it is submitted electronically to the Environmental Protection Agency (EPA) and shall provide the Shoshone-Bannock Tribes Water Resources Department the acknowledgement of receipt of the NOI from the EPA within 7 calendar days of receipt from the EPA.

**9.7.3 WAR10F000 Areas in the State of Washington, except those located on Indian country, subject to construction activity by a Federal Operator.** The following conditions apply only to discharges on federal facilities in the State of Washington:

- a. Discharges shall not cause or contribute to a violation of surface water quality standards (Chapter 173-201A WAC), groundwater quality standards (Chapter 173-200 WAC), sediment management standards (Chapter 173-204 WAC), and human health-based criteria in the National Toxics Rule (40 CFR Part 131.36). Discharges that are not in compliance with these standards are not authorized.
- b. Prior to the discharge of stormwater and non-storm water to waters of the State, the Permittee must apply all known, available, and reasonable methods of prevention, control, and treatment (AKART). This includes the preparation and implementation of an adequate SWPPP, with all appropriate BMPs installed and maintained in accordance with the SWPPP and the terms and conditions of this permit.
- c. Permittees who discharge to segments of waterbodies listed as impaired by the State of Washington under Section 303(d) of the Clean Water Act for turbidity, fine sediment, phosphorus, or pH must comply with the following numeric effluent limits:

| Parameter Identified in 303(d) Listing   | Parameter Sampled | Unit | Analytical Method   | Numeric Effluent Limit   |
|--|-------------------|------|---------------------|--|
| <ul style="list-style-type: none"> <li>• Turbidity</li> <li>• Fine Sediment</li> <li>• Phosphorus</li> </ul> | Turbidity         | NTU  | SM2130 or EPA 180.1 | 25 NTUs at the point where the stormwater is discharged from the site. |
| High pH  | pH                | Su   | pH meter            | In the range of 6.5 – 8.5  |

- d. All references and requirements associated with Section 303(d) of the Clean Water Act mean the most current EPA approved listing of impaired waters that exists on February 16, 2017, or the date when the operator's complete permit application is received by EPA, whichever is later.
- e. Discharges to waterbodies subject to an applicable Total Maximum Daily Load (TMDL) for turbidity, fine sediment, high pH, or phosphorus, shall be consistent with the assumptions and requirements of the TMDL.
  - i. Where an applicable TMDL sets specific waste load allocations or requirements for discharges covered by this permit, discharges shall be consistent with any specific waste load allocations or requirements establish by the applicable TMDL.
  - ii. Where an applicable TMDL has established a general waste load allocation for construction stormwater discharges, but no specific requirements have been identified, compliance with this permit will be assumed to be consistent with the approved TMDL.
  - iii. Where an applicable TMDL has not specified a waste load allocation for construction stormwater discharges, but has not excluded these discharges, compliance with this permit will be assumed to be consistent with the approved TMDL.
  - iv. Where an applicable TMDL specifically precludes or prohibits discharges from construction activity, the operator is not eligible for coverage under this permit.
  - v. Applicable TMDL means a TMDL for turbidity, fine sediment, high pH, or phosphorus, which has been completed and approved by EPA prior to February 16, 2017, or prior to the date the operator's complete NOI is received by EPA, whichever is later.

#### **9.7.4 WAR10I000 Indian country within the State of Washington**

**9.7.4.1 Confederated Tribes of the Colville Reservation.** The following conditions apply only to discharges on the Colville Indian Reservation (CIR) and on other Tribal trust lands or allotments of the Confederated Tribes of the Colville Reservation:

- a. A copy of the Stormwater Pollution Prevention Plan must be submitted to the following office at least thirty (30) days in advance of sending the Notice of Intent (NOI) to EPA:

Environmental Trust Department  
Confederated Tribes of the Colville Reservation  
PO Box 150  
Nespelem, WA 99155
- b. Copies of the Notice of Intent (NOI) and Notice of Termination (NOT) must be sent to the ETD at the same time they are submitted to EPA.
- c. Discharges to Omak Creek, the Okanogan River, and Columbia River downstream of Chief Joseph Dam may affect threatened or endangered species, and shall only be permitted in adherence with Appendix D of the CGP.
- d. All work shall be carried out in such a manner as will prevent violations of water quality criteria as stated in Chapter 4-8 Water Quality Standards of the Colville Law and Order Code, as amended.

- e. Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the CIR. All spills must be reported to the appropriate emergency management agency and the ETD, and measures shall be taken immediately to prevent the pollution of waters of the CIR, including groundwater.
- f. Stormwater site inspections shall be conducted at least once every 7 calendar days, within 24-hours of the occurrence of a rain event of 0.25 inches or greater in a 24-hour period, and daily during periods of saturated ground surface or snowmelt with accompanying surface runoff.
- g. Results of discharge sampling must be reported to the ETD within 7 days of sample collection. All sample reporting must include the date and time, location, and individual performing the sampling.
- h. Any corrective action reports that are required under the CGP must be submitted to the ETD at the above address within one (1) working day of the report completion.
- i. This certification does not authorize impacts to cultural, historical, or archeological features or sites, or properties that may be eligible for such listing.

**9.7.4.2 Lummi Nation.** The following conditions apply only to discharges on the Lummi Reservation:

- a. The Lummi Nation reserves the right to modify this 401 certification if the final version of the NPDES General Permit for Storm Water Discharges Associated with Construction Activity (CGP) on tribal lands in the State of Washington (Permit No. WAR10I000) is substantively different than the draft version of the proposed permit that was made available for public comments during April 2016. The Lummi Nation will determine if the final version of the NPDES CGP is substantively different than the draft version following review of the final version once the EPA makes it available.
- b. This certification does not exempt and is provisional upon compliance with other applicable statutes and codes administered by federal and Lummi tribal agencies. Pursuant to Lummi Code of Laws (LCL) 17.05.020(a), the operator must also obtain a land use permit from the Lummi Planning Department as provided in Title 15 of the Lummi Code of Laws and regulations adopted thereunder.
- c. Pursuant to LCL 17.05.020(a), each operator shall develop and submit a Storm Water Pollution Prevention Plan to the Lummi Water Resources Division for review and approval by the Water Resources Manager prior to beginning any discharge activities.
- d. Pursuant to LCL Title 17, each operator shall be responsible for achieving compliance with the Water Quality Standards for Surface Waters of the Lummi Indian Reservation (Lummi Administrative Regulations [LAR] 17 LAR 07.010 through 17 LAR 07.210 together with supplements and amendments thereto).
- e. Each operator shall submit a signed hard copy of the Notice of Intent (NOI) to the Lummi Water Resources Division at the same time it is submitted electronically to the Environmental Protection Agency (EPA) and shall provide the Lummi Water Resources Division the acknowledgement of receipt of the NOI from the EPA and the associated NPDES tracking number provided by the EPA within 7 calendar days of receipt from the EPA.



- f. Each operator shall submit a signed hard copy of the Notice of Termination (NOT) to the Lummi Water Resources Division at the same time it is submitted electronically to the EPA and shall provide the Lummi Water Resources Division the EPA acknowledgement of receipt of the NOT.
- g. Storm Water Pollution Prevention Plans, Notice of Intent, Notice of Termination and associated correspondence with the EPA shall be submitted to:

Lummi Natural Resources Department  
ATTN: Water Resources Manager  
2665 Kwina Road  
Bellingham, WA 98226-9298

**9.7.4.3 Makah Tribe.** The following conditions apply only to discharges on the Makah Reservation:

- a. The operator shall be responsible for achieving compliance with the Makah Tribe's Water Quality Standards.
- b. The operator shall submit a Storm Water Pollution Prevention Plan to the Makah Tribe Water Quality Program and Makah Fisheries Habitat Division for review and approval at least thirty (30) days prior to beginning any discharge activities.
- c. The operator shall submit a copy of the Notice of Intent to the Makah Tribe Water Quality Program and Makah Fisheries Habitat Division at the same time it is submitted to EPA.
- d. Storm Water Pollution Prevention Plans and Notices of Intent shall be submitted to:

Aaron Parker  
Makah Fisheries Management Water Quality Specialist  
(360) 645-3162  
Cell 206-356-0319  
[Aaron.parker@makah.com](mailto:Aaron.parker@makah.com)  
PO Box 115  
Neah Bay WA 98357

**9.7.4.4 Puyallup Tribe of Indians.** The following conditions apply only to discharges on the Puyallup Tribe of Indians Reservation:

- a. Each permittee shall be responsible for achieving compliance with the Puyallup Tribe's Water Quality Standards, including antidegradation provisions. The Puyallup Natural Resources Department will conduct an antidegradation review for permitted activities that have the potential to lower water quality. The antidegradation review will be consistent with the Tribe's Antidegradation Implementation Procedures. The Tribe may also impose additional controls on a site-specific basis, or request EPA to require the operator obtain coverage under an individual permit, if information in the NOI or from other sources indicates that the operator's discharges are not controlled as necessary to meet applicable water quality standards.
- b. The permittee shall be responsible for meeting any additional permit requirements imposed by EPA necessary to comply with the Puyallup Tribe's antidegradation policies if the discharge point is located within 1 linear mile upstream of waters designated by the Tribe.

- c. Each permittee shall submit a copy of the Notice of Intent (NOI) to be covered by the general permit to Char Naylor ([char.naylor@puyalluptribe.com](mailto:char.naylor@puyalluptribe.com)) and Russ Ladley ([russ.ladley@puyalluptribe.com](mailto:russ.ladley@puyalluptribe.com)) by email or at the address listed below at the same time it is submitted to EPA.

Puyallup Tribe of Indians  
3009 E. Portland Avenue  
Tacoma, WA 98404  
ATTN: Russ Ladley and Char Naylor

- d. All supporting documentation and certifications in the NOI related to coverage under the general permit for Endangered Species Act purposes shall be submitted to the Tribe's Resource Protection Manager ([russ.ladley@puyalluptribe.com](mailto:russ.ladley@puyalluptribe.com)) and Char Naylor ([char.naylor@puyalluptribe.com](mailto:char.naylor@puyalluptribe.com)) for review.
- e. If EPA requires coverage under an individual or alternative permit, the permittee shall submit a copy of the permit to Russ Ladley and Char Naylor at the address listed above.
- f. The permittee shall submit all stormwater pollution prevention plans to Char Naylor for review and approval prior to beginning any activities resulting in a discharge to tribal waters.
- g. The permittee shall conduct benchmark monitoring for turbidity (or transparency) and, in the event of significant concrete work or engineered soils, pH monitoring as well. Monitoring, benchmarks, and reporting requirements contained in Condition S.4. (pp.13-20) of the Washington State Construction Stormwater General Permit, effective January 1, 2016, shall apply, as applicable.
- h. The permittee shall notify Char Naylor (253-680-5520) and Russ Ladley (253-680-5560) prior to conducting inspections at construction sites generating storm water discharged to tribal waters.
- i. Treat dewatering discharges with controls necessary to minimize discharges of pollutants in order to minimize the discharge of pollutants to groundwater or surface waters from stormwater that is removed from excavations, trenches, foundations, vaults, or other storage areas. Examples of appropriate controls include sediment basins or sediment traps, sediment socks, dewatering tanks, tube settlers, weir tanks, and filtration systems (e.g., bag or sand filters) that are designed to remove sediment.
- To the extent feasible, utilize vegetated, upland areas of the site to infiltrate dewatering water before discharge. At all points where dewatering water is discharged, comply with the velocity dissipation requirements of Part 2.2.11 of EPA's 2016 General Construction Stormwater Permit. Examples of velocity dissipation devices include check dams, sediment traps, riprap, and grouted riprap at outlets.
- j. The permittee shall provide and maintain natural buffers to the maximum extent possible (and/or equivalent erosion and sediment controls) when tribal waters are located within 100 feet of the site's earth disturbances. If infeasible to provide and maintain an undisturbed 100 foot natural buffer, erosion and sediment controls to achieve the sediment load reduction equivalent to a 100-foot undisturbed natural buffer shall be required.

**9.7.4.5 Spokane Tribe of Indians.** The following conditions apply only to discharges on the Spokane Tribe Reservation:

- a. Pursuant to Tribal Law and Order Code (TLOC) Chapter 30 each operator shall be responsible for achieving compliance with the Surface Water Quality Standards of the Spokane Tribe. The operator shall notify the Spokane Tribe, Water Control Board (WCB) of any spills of hazardous material and;
- b. Each operator shall submit a signed hard copy of the Notice of Intent (NOI) to the WCB at the same time it is submitted to EPA.
- c. The permittee shall allow the Tribal Water Control Board or its designee to inspect and sample at the construction site as needed.
- d. Each operator shall submit a signed copy of the Notice of Termination (NOT) to the WCB at the same time it is submitted to EPA.

The correspondence address for the Spokane Tribe Water Control Board is:

Water Control Board  
c/o. Brian Crossley  
PO Box 480  
Wellpinit WA 99040  
(509)626-4409  
[crossley@spokanetribe.com](mailto:crossley@spokanetribe.com)

**9.7.4.6 Swinomish Indian Tribal Community.** The following conditions apply only to discharges on the Swinomish Reservation:

- a. Owners and operators seeking coverage under this permit who intend to discharge to Regulated Surface Waters must submit a copy of the Notice of Intent (NOI) to the DEP at the same time the NOI is submitted to EPA.
- b. Owners and operators seeking coverage under this permit must also submit a Stormwater Pollution Prevention Plan to the DEP for review and approval by DEP prior to beginning any discharge activities.
- c. Owners and operators must also submit to the DEP Changes in NOI and/or Notices of Termination at the same time they are submitted to EPA.

**9.7.4.7 Tulalip Tribes.** The following conditions apply only to discharges on the Tulalip Reservation:

- a. This certification does not exempt and is provisional upon compliance with other applicable statutes and codes administered by federal and Tulalip tribal agencies. Pursuant to Tulalip Tribes code of law, the operator must also obtain a land use permit from the Tulalip Tribes Planning Department as provided in Title 7 of the Tulalip Tribal Code (<http://www.codepublishing.com/WA/Tulalip/?Tulalip02/Tulalip0205.html>).
- b. Each CGP operator shall be responsible for achieving compliance with Tulalip Tribes Water Quality Standards.
- c. Each CGP operator shall submit their Stormwater Pollution Prevention Plan (SWPPP) to the:

Tulalip Natural & Cultural Resources Department  
Tulalip Tribes  
6406 Marine Drive  
Tulalip, WA 98271

## Appendix A - Definitions and Acronyms

### Definitions

"Action Area" – all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. See 50 CFR 402. For the purposes of this permit and for application of the threatened and endangered species protection eligibility requirements, the following areas are included in the definition of action area:

- The areas on the construction site where stormwater discharges originate and flow toward the point of discharge into the receiving waters (including areas where excavation, site development, or other ground disturbance activities occur) and the immediate vicinity. (Example: Where bald eagles nest in a tree that is on or bordering a construction site and could be disturbed by the construction activity or where grading causes stormwater to flow into a small wetland or other habitat that is on the site that contains listed species.)
- The areas where stormwater discharges flow from the construction site to the point of discharge into receiving waters. (Example: Where stormwater flows into a ditch, swale, or gully that leads to receiving waters and where listed species (such as listed amphibians) are found in the ditch, swale, or gully.)
- The areas where stormwater from construction activities discharges into receiving waters and the areas in the immediate vicinity of the point of discharge. (Example: Where stormwater from construction activities discharges into a stream segment that is known to harbor listed aquatic species.)
- The areas where stormwater controls will be constructed and operated, including any areas where stormwater flows to and from the stormwater controls. (Example: Where a stormwater retention pond would be built.)
- The areas upstream and/or downstream from the stormwater discharge into a stream segment that may be affected by these discharges. (Example: Where sediment discharged to a receiving stream settles downstream and impacts a breeding area of a listed aquatic species.)

"Agricultural Land" - cropland, grassland, rangeland, pasture, and other agricultural land, on which agricultural and forest-related products or livestock are produced and resource concerns may be addressed. Agricultural lands include cropped woodland, marshes, incidental areas included in the agricultural operation, and other types of agricultural land used for the production of livestock.

"Antidegradation Policy" or "Antidegradation Requirements" - the water quality standards regulation that requires states and tribes to establish a three-tiered antidegradation program:

1. Tier 1 maintains and protects existing uses and water quality conditions necessary to support such uses. An existing use can be established by demonstrating that fishing, swimming, or other uses have actually occurred since November 28, 1975, or that the water quality is suitable to allow such uses to occur. Where an existing use is established, it must be protected even if it is not listed in the water quality standards as a designated use. Tier 1 requirements are applicable to all surface waters.
2. Tier 2 maintains and protects "high quality" waters -- waterbodies where existing conditions are better than necessary to support CWA § 101(a)(2) "fishable/swimmable" uses. Water quality can be lowered in such waters. However, state and tribal Tier 2 programs identify procedures that must be followed and questions that must be

answered before a reduction in water quality can be allowed. In no case may water quality be lowered to a level which would interfere with existing or designated uses.

3. Tier 3 maintains and protects water quality in outstanding national resource waters (ONRWs). Except for certain temporary changes, water quality cannot be lowered in such waters. ONRWs generally include the highest quality waters of the United States. However, the ONRW classification also offers special protection for waters of exceptional ecological significance, i.e., those which are important, unique, or sensitive ecologically. Decisions regarding which water bodies qualify to be ONRWs are made by states and authorized Indian tribes.

"Arid Areas" – areas with an average annual rainfall of 0 to 10 inches.

"Bank" (e.g., stream bank or river bank) – the rising ground bordering the channel of a water of the U.S.

"Bluff" – a steep headland, promontory, riverbank, or cliff.

"Borrow Areas" – the areas where materials are dug for use as fill, either onsite or off-site.

"Business day" – for the purposes of this permit, a business day is a calendar day on which construction activities will take place.

"Bypass" – the intentional diversion of waste streams from any portion of a treatment facility. See 40 CFR 122.41(m)(1)(i).

"Cationic Treatment Chemical" – polymers, flocculants, or other chemicals that contain an overall positive charge. Among other things, they are used to reduce turbidity in stormwater discharges by chemically bonding to the overall negative charge of suspended silts and other soil materials and causing them to bind together and settle out. Common examples of cationic treatment chemicals are chitosan and cationic PAM.

"Commencement of Construction Activities" – the initial disturbance of soils (or 'breaking ground') associated with clearing, grading, or excavating activities or other construction-related activities (e.g., stockpiling of fill material; placement of raw materials at the site).

"Common Plan of Development or Sale" – A contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one common plan. The "common plan" of development or sale is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, sales pitch, advertisement, drawing, permit application, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating construction activities may occur on a specific plot.

"Construction Activities" – earth-disturbing activities, such as the clearing, grading, and excavation of land, and other construction-related activities (e.g., stockpiling of fill material; placement of raw materials at the site) that could lead to the generation of pollutants. Some of the types of pollutants that are typically found at construction sites are:

- sediment;
- nutrients;
- heavy metals;
- pesticides and herbicides;
- oil and grease;
- bacteria and viruses;
- trash, debris, and solids;

- treatment polymers; and
- any other toxic chemicals.

"Construction and Development Effluent Limitations and New Source Performance Standards" (C&D Rule) – as published in 40 CFR § 450, the regulation requiring effluent limitations guidelines (ELGs) and new source performance standards (NSPS) for controlling the discharge of pollutants from construction sites.

"Construction Site" or "Site" – the land or water area where construction activities will occur and where stormwater controls will be installed and maintained. The construction site includes construction support activities, which may be located at a different part of the property from where the primary construction activity will take place, or on a different piece of property altogether.

"Construction Support Activity" – a construction-related activity that specifically supports the construction activity and involves earth disturbance or pollutant-generating activities of its own, and can include activities associated with concrete or asphalt batch plants, equipment staging yards, materials storage areas, excavated material disposal areas, and borrow areas.

"Construction Waste" – discarded material (such as packaging materials; scrap construction materials; masonry products; timber, steel, pipe, and electrical cuttings; plastics; and styrofoam).

"Conveyance Channel" – a temporary or permanent waterway designed and installed to safely convey stormwater flow within and out of a construction site.

"Critical Habitat" – as defined in the Endangered Species Act at 16 U.S.C. 1531 for a threatened or endangered species, (i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of the Endangered Species Act, on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the Endangered Species Act, upon a determination by the Secretary that such areas are essential for the conservation of the species.

"CWA" – the Clean Water Act or the Federal Water Pollution Control Act, 33 U.S.C. section 1251 et seq.

"Dewatering" – the act of draining rainwater and/or ground water from building foundations, vaults, and trenches.

"Discharge" – when used without qualification, means the "discharge of a pollutant."

"Discharge of a Pollutant" – any addition of any "pollutant" or combination of pollutants to "waters of the United States" from any "point source," or any addition of any pollutant or combination of pollutants to the waters of the "contiguous zone" or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation. This includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works. See 40 CFR 122.2.

"Discharge Point" – for the purposes of this permit, the location where collected and concentrated stormwater flows are discharged from the construction site.

"Discharge-Related Activity" – activities that cause, contribute to, or result in stormwater and allowable non-stormwater point source discharges, and measures such as the siting, construction, and operation of stormwater controls to control, reduce, or prevent pollutants from being discharged.

“Discharge to an Impaired Water” – for the purposes of this permit, a discharge to an impaired water occurs if the first water of the U.S. to which you discharge is identified by a state, tribe, or EPA pursuant to Section 303(d) of the Clean Water Act as not meeting an applicable water quality standard and (1) requires development of a total maximum daily load (TMDL) (pursuant to section 303(d) of the CWA; or (2) is addressed by an EPA-approved or established TMDL; or (3) is not in either of the above categories but the waterbody is covered by a pollution control program that meets the requirements of 40 CFR 130.7(b)(1). For discharges that enter a storm sewer system prior to discharge, the water of the U.S. to which you discharge is the first water of the U.S. that receives the stormwater discharge from the storm sewer system.

“Domestic Waste” – for the purposes of this permit, typical household trash, garbage or rubbish items generated by construction activities.

“Drainageway” – an open linear depression, whether constructed or natural, that functions for the collection and drainage of surface water.

“Drought-Stricken Area” – for the purposes of this permit, an area in which the National Oceanic and Atmospheric Administration’s U.S. Seasonal Drought Outlook indicates for the period during which the construction will occur that any of the following conditions are likely: (1) “Drought to persist or intensify”, (2) “Drought ongoing, some improvement”, (3) “Drought likely to improve, impacts ease”, or (4) “Drought development likely”. See [http://www.cpc.ncep.noaa.gov/products/expert\\_assessment/sdo\\_summary.php](http://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php).

“Earth-Disturbing Activity” – actions taken to alter the existing vegetation and/or underlying soil of a site, such as clearing, grading, site preparation (e.g., excavating, cutting, and filling), soil compaction, and movement and stockpiling of top soils.

“Earth-Disturbing Activities Conducted Prior to Active Mining Activities” – Consists of two classes of earth-disturbing (i.e., clearing, grading and excavation) activities:

- a. activities performed for purposes of mine site preparation, including: cutting new rights of way (except when related to access road construction); providing access to a mine site for vehicles and equipment (except when related to access road construction); other earth disturbances associated with site preparation activities on any areas where active mining activities have not yet commenced (e.g., for heap leach pads, waste rock facilities, tailings impoundments, wastewater treatment plants); and

- b. construction of staging areas to prepare for erecting structures such as to house project personnel and equipment, mill buildings, etc., and construction of access roads.

Note: only earth-disturbing activities associated with the construction of staging areas and the construction of access roads conducted prior to active mining (see (b) above) are considered to be “construction” and therefore stormwater discharges from these activities are eligible for coverage under this permit. See Part 1.2.1.b. The activities described in (a) above are not considered to be “construction” and therefore stormwater discharges associated with this activity are not eligible for coverage under this permit.

“Effective Operating Condition” – for the purposes of this permit, a stormwater control is kept in effective operating condition if it has been implemented and maintained in such a manner that it is working as designed to minimize pollutant discharges.

“Effluent Limitations” – for the purposes of this permit, any of the Part 2 or Part 3 requirements.

“Effluent Limitations Guideline” (ELG) – defined in 40 CFR § 122.2 as a regulation published by the Administrator under section 304(b) of the CWA to adopt or revise effluent limitations.

“Eligible” – for the purposes of this permit, refers to stormwater and allowable non-stormwater discharges that are authorized for coverage under this general permit.

"Emergency-Related Project" – a project initiated in response to a public emergency (e.g., mud slides, earthquake, extreme flooding conditions, disruption in essential public services), for which the related work requires immediate authorization to avoid imminent endangerment to human health or the environment, or to reestablish essential public services.

"Endangered Species" – defined in the Endangered Species Act at 16 U.S.C. 1531 as any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man.

"Excursion" – a measured value that exceeds a specified limit.

"Existing Site" – a site where construction activities commenced prior to February 16, 2017.

"Exit Points" – any points of egress from the construction site to be used by vehicles and equipment during construction activities.

"Exposed Soils" – for the purposes of this permit, soils that as a result of earth-disturbing activities are left open to the elements.

"Federal Operator" – an entity that meets the definition of "Operator" in this permit and is either any department, agency or instrumentality of the executive, legislative, and judicial branches of the Federal government of the United States, or another entity, such as a private contractor, performing construction activity for any such department, agency, or instrumentality.

"Final Stabilization" – on areas not covered by permanent structures, either (1) uniform, perennial vegetation (*e.g., evenly distributed, without large bare areas*) has been established, or for arid or semi-arid areas, will be established that provides 70 percent or more of the cover that is provided by vegetation native to local undisturbed areas, and/or (2) permanent non-vegetative stabilization measures (*e.g., riprap, gravel, gabions, and geotextiles*) have been implemented to provide effective cover for exposed portions of the site

"General Contractor" – for the purposes of this permit, the primary individual or company solely accountable to perform a contract. The general contractor typically supervises activities, coordinates the use of subcontractors, and is authorized to direct workers at a site to carry out activities required by the permit.

"Hazardous Substances" or "Hazardous or Toxic Waste" – for the purposes of this permit, any liquid, solid, or contained gas that contain properties that are dangerous or potentially harmful to human health or the environment. See also 40 CFR §261.2.

"Historic Property" – as defined in the National Historic Preservation Act regulations, means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria.

"Impaired Water" – a water identified by the state, tribe, or EPA as not meeting an applicable water quality standard and (1) requires development of a TMDL (pursuant to section 303(d) of the CWA; or (2) is addressed by an EPA-approved or established TMDL; or (3) is not in either of the above categories but the waterbody is covered by a pollution control program that meets the requirements of 40 CFR 130.7(b)(1).

"Impervious Surface" – for the purpose of this permit, any land surface with a low or no capacity for soil infiltration including, but not limited to, pavement, sidewalks, parking areas and driveways, packed gravel or soil, or rooftops.



“Indian Country” or “Indian Country Lands” – defined at 40 CFR §122.2 as:

1. All land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation;
2. All dependent Indian communities with the borders of the United States whether within the originally or subsequently acquired territory thereof, and whether within or without the limits of a state; and
3. All Indian allotments, the Indian titles to which have not been extinguished, including rights-of-ways running through the same.

“Infeasible” – for the purpose of this permit, infeasible means not technologically possible or not economically practicable and achievable in light of best industry practices. EPA notes that it does not intend for any permit requirement to conflict with state water rights law.

“Install” or “Installation” – when used in connection with stormwater controls, to connect or set in position stormwater controls to make them operational.

“Jar test” – a test designed to simulate full-scale coagulation/flocculation/sedimentation water treatment processes by taking into account the possible conditions.

“Landward” – positioned or located away from a waterbody, and towards the land.

“Large Construction Activity” – defined at 40 CFR § 122.26(b)(14)(x) and incorporated here by reference. Large construction activity includes clearing, grading, and excavating resulting in a land disturbance that will disturb equal to or greater than five acres of land or will disturb less than five acres of total land area but is part of a larger common plan of development or sale that will ultimately disturb equal to or greater than five acres. Large construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the site.

“Linear Construction Site” – includes the construction of roads, bridges, conduits, substructures, pipelines, sewer lines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment and associated ancillary facilities in a long, narrow area.

“Minimize” – to reduce and/or eliminate to the extent achievable using stormwater controls that are technologically available and economically practicable and achievable in light of best industry practices.

“Mining Activity” – for the purposes of this permit, includes mining-related construction activities defined at 40 CFR 122.26(b)(14)(x) and 122.26(b)(15)(i), and active mining activities defined at 40 CFR 122.26(b)(14)(iii). Both of these sub categories of activities include earth-disturbing activities, with the latter also including such activities as: extraction, removal or recovery, and beneficiation of mined material from the earth; removal of overburden and waste rock to expose mineable material; and site reclamation and closure activities.

“Mining Operations” – for the purposes of this permit, mining operations are grouped into two distinct categories, with distinct effluent limits and requirements applicable to each: 1) earth-disturbing activities conducted prior to active mining activities; and 2) active mining activities, which includes reclamation.

“Municipal Separate Storm Sewer System” or “MS4” – defined at 40 CFR §122.26(b)(8) as a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains):

1. Owned and operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special

districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States;

2. Designed or used for collecting or conveying stormwater;
3. Which is not a combined sewer; and
4. Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR §122.2.

"National Pollutant Discharge Elimination System" (NPDES) – defined at 40 CFR §122.2 as the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of CWA. The term includes an 'approved program.'

"Native Topsoil" – the uppermost layer of naturally occurring soil for a particular area, and is often rich in organic matter, biological activity, and nutrients.

"Natural Buffer" – for the purposes of this permit, an area of undisturbed natural cover surrounding waters of the U.S. within which construction activities are restricted. Natural cover includes the vegetation, exposed rock, or barren ground that exists prior to commencement of earth-disturbing activities.

"Natural Vegetation" – vegetation that occurs spontaneously without regular management, maintenance, or species introductions or removals, and that generally has a strong component of native species.

"New Operator of a Permitted Site" – an operator that through transfer of ownership and/or operation replaces the operator of an already permitted construction site that is either a "new site" or an "existing site".

"New Site" – a site where construction activities commenced on or after February 16, 2017.

"New Source" – for the purposes of this permit, a construction project that commenced construction activities after February 1, 2010.

"New Source Performance Standards (NSPS)" – for the purposes of this permit, NSPS are technology-based standards that apply to construction sites that are new sources under 40 CFR 450.24.

"Non-Stormwater Discharges" – discharges that do not originate from storm events. They can include, but are not limited to, discharges of process water, air conditioner condensate, non-contact cooling water, vehicle wash water, sanitary wastes, concrete washout water, paint wash water, irrigation water, or pipe testing water.

"Non-Turbid" – a discharge that does not cause or contribute to an exceedence of turbidity-related water quality standards.

"Notice of Intent" (NOI) – the form (electronic or paper) required for authorization of coverage under the Construction General Permit.

"Notice of Termination" (NOT) – the form (electronic or paper) required for terminating coverage under the Construction General Permit.

"NPDES eReporting Tool" (NeT) – EPA's online system for submitting electronic Construction General Permit forms.

“Operational” – for the purposes of this permit, stormwater controls are made “operational” when they have been installed and implemented, are functioning as designed, and are properly maintained.

“Operator” – for the purposes of this permit and in the context of stormwater discharges associated with construction activity, any party associated with a construction project that meets either of the following two criteria:

1. The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications (*e.g. in most cases this is the owner of the site*); or
2. The party has day-to-day operational control of those activities at a project that are necessary to ensure compliance with the permit conditions (*e.g., they are authorized to direct workers at a site to carry out activities required by the permit; in most cases this is the general contractor of the project*).

This definition is provided to inform permittees of EPA's interpretation of how the regulatory definitions of “owner or operator” and “facility or activity” are applied to discharges of stormwater associated with construction activity. Subcontractors generally are not considered operators for the purposes of this permit.

“Ordinary High Water Mark” – the line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, and/or the presence of litter and debris.

“Permitting Authority” – for the purposes of this permit, EPA, a Regional Administrator of EPA, or an authorized representative.

“Point(s) of Discharge” – see “Discharge Point.”

“Point Source” – any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff.

“Pollutant” – defined at 40 CFR § 122.2. A partial listing from this definition includes: dredged spoil, solid waste, sewage, garbage, sewage sludge, chemical wastes, biological materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial or municipal waste.

“Pollution Prevention Controls” – stormwater controls designed to reduce or eliminate the addition of pollutants to construction site discharges through analysis of pollutant sources, implementation of proper handling/disposal practices, employee education, and other actions.

“Polymers” – for the purposes of this permit, coagulants and flocculants used to control erosion on soil or to enhance the sediment removal capabilities of sediment traps or basins. Common construction site polymers include polyacrylamide (PAM), chitosan, alum, polyaluminum chloride, and gypsum.

“Prohibited Discharges” – discharges that are not allowed under this permit, including:

1. Wastewater from washout of concrete;
2. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;
3. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance;

4. Soaps or solvents used in vehicle and equipment washing;
5. Toxic or hazardous substances from a spill or other release; and
6. Waste, garbage, floatable debris, construction debris, and sanitary waste.

"Provisionally Covered Under this Permit" – for the purposes of this permit, EPA provides temporary coverage under this permit for emergency-related projects prior to receipt of a complete and accurate NOI. Discharges from earth-disturbing activities associated with the emergency-related projects are subject to the terms and conditions of the permit during the period of temporary coverage.

"Qualified Person" – a person knowledgeable in the principles and practice of erosion and sediment controls and pollution prevention, who possesses the appropriate skills and training to assess conditions at the construction site that could impact stormwater quality, and the appropriate skills and training to assess the effectiveness of any stormwater controls selected and installed to meet the requirements of this permit.

"Receiving Water" – a "Water of the United States" as defined in 40 CFR § 122.2 into which the regulated stormwater discharges.

"Run-On" – sources of stormwater that drain from land located upslope or upstream from the regulated site in question.

"Semi-Arid Areas" – areas with an average annual rainfall of 10 to 20 inches.

"Shared Control" - for the purposes of this permit, a stormwater control, such as a sediment basin or pond, used by two or more operators that is installed and maintained for the purpose of minimizing and controlling pollutant discharges from a construction site with multiple operators associated with a common plan of development or sale. Any operators that are contributing stormwater from their construction activities to a shared control are considered to rely upon a shared control.

"Small Construction Activity" – defined at 40 CFR § 122.26(b)(15) and incorporated here by reference. A small construction activity includes clearing, grading, and excavating resulting in a land disturbance that will disturb equal to or greater than one (1) acre and less than five (5) acres of land or will disturb less than one (1) acre of total land area but is part of a larger common plan of development or sale that will ultimately disturb equal to or greater than one (1) acre and less than five (5) acres. Small construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the site.

"Small Residential Lot" – for the purpose of this permit, a lot being developed for residential purposes that will disturb less than 1 acre of land, but is part of a larger residential project that will ultimately disturb greater than or equal to 1 acre.

"Snowmelt" – the conversion of snow into overland stormwater and ground water flow as a result of warmer temperatures.

"Spill" – for the purpose of this permit, the release of a hazardous or toxic substance from its container or containment.

"Stabilization" – the use of vegetative and/or non-vegetative cover to prevent erosion and sediment loss in areas exposed through the construction process.

"Steep Slopes" – where a state, tribe, local government, or industry technical manual (e.g., stormwater BMP manual) has defined what is to be considered a "steep slope", this permit's definition automatically adopts that definition. Where no such definition exists, steep slopes are automatically defined as those that are 15 percent or greater in grade.

"Storm Sewer System" – a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains) designed or used for collecting or conveying stormwater.

"Stormwater" – stormwater runoff, snowmelt runoff, and surface runoff and drainage.

"Stormwater Control" - refers to any best management practice or other method (including narrative effluent limitations) used to prevent or reduce the discharge of pollutants to waters of the United States.

"Stormwater Discharge Associated with Construction Activity" – as used in this permit, a discharge of pollutants in stormwater to waters of the United States from areas where earth-disturbing activities (e.g., clearing, grading, or excavation) occur, or where construction materials or equipment storage or maintenance (e.g., fill piles, borrow area, concrete truck chute washdown, fueling), or other industrial stormwater directly related to the construction process (e.g., concrete or asphalt batch plants), are located.

"Stormwater Inlet" – a structure placed below grade to conduct water used to collect stormwater runoff for conveyance purposes.

"Stormwater Team" – the group of individuals responsible for oversight of the development and modifications of the SWPPP, and oversight of compliance with the permit requirements. The individuals on the "Stormwater Team" must be identified in the SWPPP.

"Storm Event" – a precipitation event that results in a measurable amount of precipitation.

"Storm Sewer" – a system of pipes (separate from sanitary sewers) that carries stormwater runoff from buildings and land surfaces.

"Subcontractor" – for the purposes of this permit, an individual or company that takes a portion of a contract from the general contractor or from another subcontractor.

"SWPPP" (Stormwater Pollution Prevention Plan) – a site-specific, written document that, among other things: (1) identifies potential sources of stormwater pollution at the construction site; (2) describes stormwater controls to reduce or eliminate pollutants in stormwater discharges from the construction site; and (3) identifies procedures the operator will implement to comply with the terms and conditions of this general permit.

"Temporary Stabilization" – a condition where exposed soils or disturbed areas are provided temporary vegetative and/or non-vegetative protective cover to prevent erosion and sediment loss. Temporary stabilization may include temporary seeding, geotextiles, mulches, and other techniques to reduce or eliminate erosion until either final stabilization can be achieved or until further construction activities take place to re-disturb this area.

"Thawing Conditions" – for the purposes of this permit, thawing conditions are expected based on the historical likelihood of two or more days with daytime temperatures greater than 32°F. This date can be determined by looking at historical weather data. Note: the estimation of thawing conditions is for planning purposes only. During construction the permittee will be required to conduct site inspections based upon actual conditions (i.e., if thawing conditions occur sooner than expected, the permittee will be required to conduct inspections at the regular frequency).

"Threatened Species" – defined in the Endangered Species Act at 16 U.S.C. 1531 as any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

"Tier 2 Waters" – for antidegradation purposes, pursuant to 40 CFR 131.12(a)(2), those waters that are characterized as having water quality that exceeds the levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water.

“Tier 2.5 Waters” – for antidegradation purposes, those waters designated by states or tribes as requiring a level of protection equal to and above that given to Tier 2 waters, but less than that given Tier 3 waters. Some states have special requirements for these waters.

“Tier 3 Waters” – for antidegradation purposes, pursuant to 40 CFR 131.12(a)(3), Tier 3 waters are identified by states as having high quality waters constituting an Outstanding National Resource Water (ONRW), such as waters of National Parks and State Parks, wildlife refuges, and waters of exceptional recreational or ecological significance.

“Total Maximum Daily Load” or “TMDL” – the sum of the individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background. If receiving water has only one point source discharger, the TMDL is the sum of that point source WLA plus the LAs for any nonpoint sources of pollution and natural background sources, tributaries, or adjacent segments. TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measure.

“Toxic Waste” – see “Hazardous Substances.”

“Treatment Chemicals” – polymers, flocculants, or other chemicals used to reduce turbidity in stormwater.

“Turbidity” – a condition of water quality characterized by the presence of suspended solids and/or organic material.

“Uncontaminated Discharge” – in the context of authorized non-stormwater discharges, a discharge that does not cause or contribute to an exceedance of applicable water quality standards.

“Upland” – the dry land area above and ‘landward’ of the ordinary high water mark.

“Upset” – Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond your reasonable control. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation. See 40 CFR 122.41(n)(1).

“Water-Dependent Structures” – structures or facilities that are required to be located directly adjacent to a waterbody or wetland, such as a marina, pier, boat ramp, etc.

“Water Quality Standards” – defined in 40 CFR § 131.3, and are provisions of state or federal law which consist of a designated use or uses for the waters of the United States, water quality criteria for such waters based upon such uses, and an antidegradation policy to protect high-quality waters. Water quality standards protect the public health or welfare, enhance the quality of water and serve the purposes of the Act.

“Waters of the United States” – see definition at 40 CFR 122.2.

“Wetland” – those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. On-site evaluations are typically required to confirm the presence and boundaries of wetlands.

## **Acronyms**

ACHP – Advisory Council on Historic Preservation  
BMP – Best Management Practice  
CBI – Confidential Business Information  
CGP – Construction General Permit  
CFR – Code of Federal Regulations  
CWA – Clean Water Act  
CZMA – Coastal Zone Management Act  
ECHO – EPA Enforcement and Compliance History Online  
ELG – Effluent Limitations Guideline  
EPA – United States Environmental Protection Agency  
ESA – Endangered Species Act  
FR – Federal Register  
MS4 – Municipal Separate Storm Sewer System  
MSGP – Multi-Sector General Permit  
NEPA – National Environmental Policy Act  
NeT – NPDES eReporting Tool  
NHPA – National Historic Preservation Act  
NMFS – United States National Marine Fisheries Service  
NPDES – National Pollutant Discharge Elimination System  
NOI – Notice of Intent  
NOT – Notice of Termination  
NPDES – National Pollutant Discharge Elimination System  
NRC – National Response Center  
NRCS – National Resources Conservation Service  
NSPS – New Source Performance Standards  
ONRW – Outstanding National Resource Water  
PAM – Polyacrylamide  
POTW – Publicly Owned Treatment Works  
RUSLE – Revised Universal Soil Loss Equation  
SDS – Safety Data Sheet  
SHPO – State Historic Preservation Office  
SPCC – Spill Prevention Control and Countermeasure  
SWPPP – Stormwater Pollution Prevention Plan  
THPO – Tribal Historic Preservation Office

TMDL – Total Maximum Daily Load

TSS – Total Suspended Solids

UIC – Underground Injection Control

USDA – United States Department of Agriculture

USFWS – United States Fish and Wildlife Service

USGS – United States Geological Survey

WQS – Water Quality Standard



## Appendix B - Permit Areas Eligible for Coverage and EPA Regional Addresses

Permit coverage for stormwater discharges from construction activity occurring within the following areas is provided by legally separate and distinctly numbered permits.

### B.1 EPA Region 1

The permit offers coverage for stormwater discharges from construction activity from the following areas in EPA Region 1:

| <b>Permit No.</b> | <b><u>Areas of Coverage/Where EPA is Permitting Authority</u></b>   |
|-------------------|---|
| <b>CTR10I000</b>  | Indian country within the State of Connecticut  |
| <b>MAR100000</b>  | Commonwealth of Massachusetts (except Indian country)   |
| <b>MAR10I000</b>  | Indian country within the State of Massachusetts  |
| <b>NHR100000</b>  | State of New Hampshire  |
| <b>RIR10I000</b>  | Indian country within the State of Rhode Island   |
| <b>VTR10F000</b>  | Areas in the State of Vermont subject to construction by a Federal Operator   |
| <b>01R10I000</b>  | All areas of Indian country not identified above that are not already covered by an EPA-approved permitting program |

For stormwater discharges in EPA Region 1 outside the areas of coverage identified above, please contact your state NPDES permitting authority to obtain coverage under a state-issued NPDES permit.

#### **EPA Region 1 Address:**

U.S. EPA Region 1  
Office of Ecosystem Protection  
Stormwater and Construction Permits Section  
5 Post Office Square, Suite 100  
(OEP 06-1)  
Boston, MA 02109-3912

### B.2 EPA Region 2

The permit offers coverage for stormwater discharges from construction activity from the following areas in EPA Region 2:

| <b>Permit No.</b> | <b><u>Areas of Coverage/Where EPA is Permitting Authority</u></b>   |
|-------------------|---|
| <b>NYR10I000</b>  | Indian country within the State of New York   |
| <b>PRR100000</b>  | Commonwealth of Puerto Rico   |
| <b>02R10I000</b>  | All areas of Indian country not identified above that are not already covered by an EPA-approved permitting program |

For stormwater discharges in EPA Region 2 outside the areas of coverage identified above, please contact your state NPDES permitting authority to obtain coverage under a state-issued NPDES permit.

**EPA Region 2 Address:***For Puerto Rico:*

U.S. EPA Region 2  
Caribbean Environmental Protection Division  
NPDES Stormwater Program  
City View Plaza II – Suite 7000  
48 Rd. 165 Km 1.2  
Guaynabo, PR 00968-8069

*For New York:*

U.S. EPA Region 2  
NPDES Stormwater Program  
290 Broadway, 24th Floor  
New York, NY 10007-1866

**B.3 EPA Region 3**

The permit offers coverage for stormwater discharges from construction activity from the following areas in EPA Region 3:

| <b><u>Permit No.</u></b> | <b><u>Areas of Coverage/Where EPA is Permitting Authority</u></b>   |
|--------------------------|---|
| <b>DCR100000</b>         | District of Columbia  |
| <b>DER10F000</b>         | Areas in the State of Delaware subject to construction by a Federal Operator  |
| <b>VAR10I000</b>         | Indian country within the State of Virginia   |
| <b>03R10I000</b>         | All areas of Indian country not identified above that are not already covered by an EPA-approved permitting program |

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For stormwater discharges in EPA Region 3 outside the areas of coverage identified above, please contact your state NPDES permitting authority to obtain coverage under a state-issued NPDES permit.

**EPA Region 3 Address:**

U.S. EPA Region 3  
Office of NPDES Permits and Enforcement  
NPDES Permits Branch, Mailcode 3WP41  
1650 Arch Street  
Philadelphia, PA 19103

**B.4 EPA Region 4**

The permit offers coverage for stormwater discharges from construction activity from the following areas in EPA Region 4:

| <b><u>Permit No.</u></b> | <b><u>Areas of Coverage/Where EPA is Permitting Authority</u></b>  |
|--------------------------|--|
| <b>ALR10I000</b>         | Indian country within the State of Alabama   |
| <b>FLR10I000</b>         | Indian country within the State of Florida   |
| <b>MSR10I000</b>         | Indian country within the State of Mississippi   |
| <b>NCR10I000</b>         | Indian country within the State of North Carolina  |
| <b>04R10I000</b>         | All areas of Indian country not identified above that are not already covered by an EPA-approved permitting program (except Catawba lands in South Carolina) |

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For stormwater discharges in EPA Region 4 outside the areas of coverage identified above, please contact your state NPDES permitting authority to obtain coverage under a state-issued NPDES permit.

**EPA Region 4 Address:**

U.S. EPA Region 4  
Water Protection Division  
NPDES Stormwater Program  
Atlanta Federal Center  
61 Forsyth Street SW  
Atlanta, GA 30303-3104

**B.5 EPA Region 5**

The permit offers coverage for stormwater discharges from construction activity from the following areas in EPA Region 5:

| <b><u>Permit No.</u></b> | <b><u>Areas of Coverage/Where EPA is Permitting Authority</u></b>   |
|--------------------------|---|
| <b>MIR10I000</b>         | Indian country within the State of Michigan   |
| <b>MNR10I000</b>         | Indian country within the State of Minnesota  |
| <b>WIR10I000</b>         | Indian country within the State of Wisconsin, except the Sokaogon Chippewa (Mole Lake) Community                    |
| <b>05R10I000</b>         | All areas of Indian country not identified above that are not already covered by an EPA-approved permitting program |

For stormwater discharges in EPA Region 5 outside the areas of coverage identified above, please contact your state NPDES permitting authority to obtain coverage under a state-issued NPDES permit.

**EPA Region 5 Address:**

U.S. EPA Region 5  
NPDES Program Branch  
77 W. Jackson Blvd.  
Mail Code WN16J  
Chicago, IL 60604-3507

**B.6 EPA Region 6**

The permit offers coverage for stormwater discharges from construction activity from the following areas in EPA Region 6:

| <b><u>Permit No.</u></b> | <b><u>Areas of Coverage/Where EPA is Permitting Authority</u></b>   |
|--------------------------|---|
| <b>LAR10I000</b>         | Indian country within the State of Louisiana  |
| <b>NMR100000</b>         | State of New Mexico, except Indian country  |
| <b>NMR10I000</b>         | Indian country within the State of New Mexico, except Navajo Reservation Lands that are covered under Arizona permit AZR10I000 and Ute Mountain Reservation Lands that are covered under Colorado permit COR10I000. |
| <b>OKR10I000</b>         | Indian country within the State of Oklahoma   |
| <b>OKR10F000</b>         | Discharges in the State of Oklahoma that are not under the authority of the Oklahoma Department of Environmental Quality, including activities associated with oil and gas exploration, drilling, operations, and   |

| <b><u>Permit No.</u></b> | <b><u>Areas of Coverage/Where EPA is Permitting Authority</u></b>  |
|--------------------------|--|
|                          | pipelines (includes SIC Groups 13 and 46, and SIC codes 492 and 5171), and point source discharges associated with agricultural production, services, and silviculture (includes SIC Groups 01, 02, 07, 08, 09).   |
| <b>TXR10F000</b>         | Discharges in the State of Texas that are not under the authority of the Texas Commission on Environmental Quality (formerly TNRCC), including activities associated with the exploration, development, or production of oil or gas or geothermal resources, including transportation of crude oil or natural gas by pipeline. |
| <b>TXR10I000</b>         | Indian country within the State of Texas   |
| <b>06R10I000</b>         | All areas of Indian country not identified above that are not already covered by an EPA-approved permitting program  |

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For stormwater discharges in EPA Region 6 outside the areas of coverage identified above, please contact your state NPDES permitting authority to obtain coverage under a state-issued NPDES permit.

**EPA Region 6 Address:**

U.S. EPA Region 6  
NPDES Stormwater Program (WQ-PP)  
1445 Ross Avenue, Suite 1200  
Dallas, TX 75202-2733

**B.7 EPA Region 7**

The permit offers coverage for stormwater discharges from construction activity from the following areas in EPA Region 7:

| <b><u>Permit No.</u></b> | <b><u>Areas of Coverage/Where EPA is Permitting Authority</u></b>   |
|--------------------------|---|
| <b>IAR10I000</b>         | Indian country within the State of Iowa   |
| <b>KSR10I000</b>         | Indian country within the State of Kansas   |
| <b>NER10I000</b>         | Indian country within the State of Nebraska, except Pine Ridge Reservation lands (see Region 8)                     |
| <b>07R10I000</b>         | All areas of Indian country not identified above that are not already covered by an EPA-approved permitting program |

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For stormwater discharges in EPA Region 7 outside the areas of coverage identified above, please contact your state NPDES permitting authority to obtain coverage under a state-issued NPDES permit.

**EPA Region 7 Address:**

U.S. EPA Region 7  
NPDES Stormwater Program  
11201 Renner Blvd  
Lenexa, KS 66219

**B.8 EPA Region 8**

The permit offers coverage for stormwater discharges from construction activity from the following areas in EPA Region 8:

| <b><u>Permit No.</u></b> | <b><u>Areas of Coverage/Where EPA is Permitting Authority</u></b>   |
|--------------------------|---|
| <b>COR10F000</b>         | Areas in the State of Colorado, except those located on Indian country, subject to construction activity by a Federal Operator  |
| <b>COR10I000</b>         | Indian country within the State of Colorado, as well as the portion of the Ute Mountain Reservation located in New Mexico   |
| <b>MTR10I000</b>         | Indian country within the State of Montana  |
| <b>NDR10I000</b>         | Indian country within the State of North Dakota, as well as that portion of the Standing Rock Reservation located in South Dakota (except for the portion of the lands within the former boundaries of the Lake Traverse Reservation which is covered under South Dakota permit SDR10I000 listed below)   |
| <b>SDR10I000</b>         | Indian country within the State of South Dakota, as well as the portion of the Pine Ridge Reservation located in Nebraska and the portion of the lands within the former boundaries of the Lake Traverse Reservation located in North Dakota (except for the Standing Rock Reservation which is covered under North Dakota permit NDR10I000 listed above) |
| <b>UTR10I000</b>         | Indian country within the State of Utah, except Goshute and Navajo Reservation lands (see Region 9)   |
| <b>WYR10I000</b>         | Indian country within the State of Wyoming  |
| <b>08R10I000</b>         | All areas of Indian country not identified above that are not already covered by an EPA-approved permitting program   |

For stormwater discharges in EPA Region 8 outside the areas of coverage identified above, please contact your state NPDES permitting authority to obtain coverage under a state-issued NPDES permit.

#### **EPA Region 8 Address:**

EPA Region 8 Storm Water Program  
Mailcode: 8P-W-WW  
1595 Wynkoop Street  
Denver, CO 80202-1129

#### **B.9 EPA Region 9**

The permit offers coverage for stormwater discharges from construction activity from the following areas in EPA Region 9:

| <b><u>Permit No.</u></b> | <b><u>Areas of Coverage/Where EPA is Permitting Authority</u></b>  |
|--------------------------|--|
| <b>ASR100000</b>         | Island of American Samoa   |
| <b>AZR10I000</b>         | Indian country within the State of Arizona, as well as Navajo Reservation lands in New Mexico and Utah   |
| <b>CAR10I000</b>         | Indian country within the State of California  |
| <b>GUR100000</b>         | Island of Guam   |
| <b>JAR100000</b>         | Johnston Atoll   |
| <b>MPR100000</b>         | Commonwealth of the Northern Mariana Islands   |
| <b>MWR100000</b>         | Midway Island and Wake Island  |
| <b>NVR10I000</b>         | Indian country within the State of Nevada, as well as the Duck Valley Reservation in Idaho, the Fort McDermitt Reservation in Oregon and the Goshute Reservation in Utah |
| <b>09R10I000</b>         | All areas of Indian country not identified above that are not already covered by an EPA-approved permitting program  |

For stormwater discharges in EPA Region 9 outside the areas of coverage identified above, please contact your state NPDES permitting authority to obtain coverage under a state-issued NPDES permit.

**EPA Region 9 Address:**

U.S. EPA Region 9  
Water Division  
NPDES Stormwater Program (WTR-2-3)  
75 Hawthorne Street  
San Francisco, CA 94105-3901

**B.10 EPA Region 10**

The permit offers coverage for stormwater discharges from construction activity from the following areas in EPA Region 10:

| <b><u>Permit No.</u></b> | <b><u>Areas of Coverage/Where EPA is Permitting Authority</u></b>  |
|--------------------------|--|
| <b>AKR10I000</b>         | Indian country lands as defined in 18 U.S.C. 1151 within the State of Alaska   |
| <b>AKR10F000</b>         | Denali National Park and Preserve  |
| <b>IDR100000</b>         | State of Idaho, except Indian country  |
| <b>IDR10I000</b>         | Indian country within the State of Idaho, except Duck Valley Reservation lands (see Region 9)                                    |
| <b>ORR10I000</b>         | Indian country within the State of Oregon, except Fort McDermitt Reservation lands (see Region 9)                                |
| <b>WAR10F000</b>         | Areas in the State of Washington, except those located on Indian country, subject to construction activity by a Federal Operator |
| <b>WAR10I000</b>         | Indian country within the State of Washington  |

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For stormwater discharges in EPA Region 10 outside the areas of coverage identified above, please contact your state NPDES permitting authority to obtain coverage under a state-issued NPDES permit.

**EPA Region 10 Address:**

U.S. EPA Region 10  
NPDES Stormwater Program  
1200 6th Avenue (OWW-191)  
Seattle, WA 98101-3140

## Appendix C - Small Construction Waivers and Instructions

These waivers are only available to stormwater discharges associated with small construction activities (i.e., 1-5 acres). As the operator of a small construction activity, you may be able to qualify for a waiver in lieu of needing to obtain coverage under this general permit based on: (A) a low rainfall erosivity factor, (B) a TMDL analysis, or (C) an equivalent analysis that determines allocations for small construction sites are not needed. Each operator, otherwise needing permit coverage, must notify EPA of its intention for a waiver. It is the responsibility of those individuals wishing to obtain a waiver from coverage under this general permit to submit a complete and accurate waiver certification as described below. Where the operator changes or another is added during the construction project, the new operator must also submit a waiver certification to be waived.

### C.1 Rainfall Erosivity Waiver

Under this scenario the small construction project's rainfall erosivity factor calculation ("R" in the Revised Universal Soil Loss Equation) is less than five during the period of construction activity. The operator must certify to EPA that construction activity will occur only when the rainfall erosivity factor is less than five. The period of construction activity begins at initial earth disturbance and ends with final stabilization. Where vegetation will be used for final stabilization, the date of installation of a stabilization practice that will provide interim non-vegetative stabilization can be used for the end of the construction period, provided the operator commits (as a condition of waiver eligibility) to periodically inspect and properly maintain the area until the criteria for final stabilization as defined in the CGP have been met. If use of this interim stabilization eligibility condition was relied on to qualify for the waiver, signature on the waiver with its certification statement constitutes acceptance of and commitment to complete the final stabilization process. The operator must submit a waiver certification to EPA prior to commencing construction activities.

*Note: The rainfall erosivity factor "R" is determined in accordance with Chapter 2 of Agriculture Handbook Number 703, Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE), pages 21–64, dated January 1997; United States Department of Agriculture (USDA), Agricultural Research Service.*

EPA has developed an online rainfall erosivity calculator to help small construction sites determine potential eligibility for the rainfall erosivity waiver. You can access the calculator from EPA's website at: <https://www.epa.gov/npdes/rainfall-erosivity-factor-calculator-small-construction-sites>. The R factor can easily be calculated by using the construction site latitude/longitude or address and estimated start and end dates of construction. This calculator may also be useful in determining the time periods during which construction activity could be waived from permit coverage. You may find that moving your construction activity by a few weeks or expediting site stabilization will allow you to qualify for the waiver. Use this online calculator or the Construction Rainfall Erosivity Waiver Fact Sheet (<https://www.epa.gov/sites/production/files/2015-10/documents/fact3-1.pdf>) to assist in determining the R Factor for your small construction site.

If you are the operator of the construction activity and eligible for a waiver based on low erosivity potential, you can submit a rainfall erosivity waiver electronically via EPA's NPDES eReporting Tool (NeT) (<https://www.epa.gov/npdes/stormwater-discharges-construction-activities#ereporting>), unless you received a waiver from your EPA Regional Office (see Part 1.4.1 of the CGP for information about receiving a waiver from electronic reporting).

*Note: If the R factor is five or greater, you do not qualify for the rainfall erosivity waiver, and must obtain coverage under an NPDES permit (e.g., the CGP), unless you qualify for the Water Quality Waiver as described in section B below.*

If your small construction project continues beyond the projected completion date given on the waiver certification, you must recalculate the rainfall erosivity factor for the new project duration. If the R factor is below five, you must update all applicable information on the waiver certification and retain a copy of the revised waiver as part of your records. The new waiver certification must be submitted prior to the projected completion date listed on the original waiver form to assure your exemption from permitting requirements is uninterrupted. If the new R factor is five or above, you must obtain NPDES permit coverage.

## **C.2 TMDL Waiver**

This waiver is available if EPA has established or approved a TMDL that addresses the pollutant(s) of concern for the impaired water and has determined that controls on stormwater discharges from small construction activity are not needed to protect water quality. The pollutant(s) of concern include sediment (such as total suspended solids, turbidity or siltation) and any other pollutant that has been identified as a cause of impairment of any waterbody that will receive a discharge from the construction activity. Information on TMDLs that have been established or approved by EPA is available from EPA online at <https://www.epa.gov/tmdl> and from state and tribal water quality agencies.

If you are the operator of the construction activity and eligible for a waiver based on compliance with an EPA-established or approved TMDL, you must provide the following information in order to be waived from permitting requirements:

1. Name, address and telephone number of the construction site operator(s);
2. Name (or other identifier), address, county or similar governmental subdivision, and latitude/longitude of the construction project or site;
3. Estimated construction start and completion (i.e., final stabilization) dates, and total acreage (to the nearest quarter acre) to be disturbed;
4. The name of the waterbody(s) that would be receiving stormwater discharges from your construction project;
5. The name and approval date of the TMDL;
6. A statement, signed and dated by an authorized representative as provided in Appendix I, Subsection I.11, that certifies that the construction activity will take place and that the stormwater discharges will occur, within the drainage area addressed by the TMDL.

## **C.3 Equivalent Analysis Waiver**

This waiver is available for discharges to non-impaired waters only. The operator can develop an equivalent analysis that determines allocations for his/her small construction site for the pollutant(s) of concern or determines that such allocations are not needed to protect water quality. This waiver requires a small construction operator to develop an equivalent analysis based on existing in-stream concentrations, expected growth in pollutant concentrations from all sources, and a margin of safety.

If you are a construction operator who wants to use this waiver, you must develop your equivalent analysis and provide the following information to be waived from permitting requirements:

1. Name, address and telephone number of the construction site operator(s);



2. Name (or other identifier), address, county or similar governmental subdivision, and latitude/longitude of the construction project or site;
3. Estimated construction start and completion (i.e., final stabilization) dates, and total acreage (to the nearest quarter acre) to be disturbed;
4. The name of the waterbody(s) that would be receiving stormwater discharges from your construction project;
5. Your equivalent analysis;
6. A statement, signed and dated by an authorized representative as provided in Appendix I, Subsection I.11, that certifies that the construction activity will take place and that the stormwater discharges will occur, within the drainage area addressed by the equivalent analysis.

#### **C.4 Waiver Deadlines and Submissions**

1. Waiver certifications must be submitted prior to commencement of construction activities.
2. If you submit a TMDL or equivalent analysis waiver request, you are not waived until EPA approves your request. As such, you may not commence construction activities until receipt of approval from EPA.
3. Late Notifications: Operators are not prohibited from submitting waiver certifications after initiating clearing, grading, excavation activities, or other construction activities. The Agency reserves the right to take enforcement for any unpermitted discharges that occur between the time construction commenced and waiver authorization is granted.

Submittal of a waiver certification is an optional alternative to obtaining permit coverage for discharges of stormwater associated with small construction activity, provided you qualify for the waiver. Any discharge of stormwater associated with small construction activity not covered by either a permit or a waiver may be considered an unpermitted discharge under the Clean Water Act. As mentioned above, EPA reserves the right to take enforcement for any unpermitted discharges that occur between the time construction commenced and either discharge authorization is granted or a complete and accurate waiver certification is submitted. EPA may notify any operator covered by a waiver that they must obtain NPDES permit coverage. EPA may notify any operator who has been in non-compliance with a waiver that they may no longer use the waiver for future projects. Any member of the public may petition EPA to take action under this provision by submitting written notice along with supporting justification.

Complete and accurate TMDL or equivalent analysis waiver requests must be sent to the applicable EPA Regional Office address specified in Appendix B.



United States Environmental Protection Agency  
Washington, DC 20460  
**Low Erosivity Waiver (LEW) Certification**

### I. Approval to Use Paper Form

If yes, check which waiver you have been granted, the name of the EPA Regional Office staff person who granted the waiver, and the date of approval:

☐ The owner/operator's headquarters is physically located in a geographic area (i.e., ZIP code or census tract) that is identified as under-served for broadband Internet access in the most recent report from the Federal Communications Commission.

☐ The owner/operator has issues regarding available computer access or computer capability.

| | | | | | | | | | | | | | | | | | | | | |

\_\_\_\_\_ / \_\_\_\_\_

## II. Operator Information

[illegible]

Mailing Address:

\_\_\_\_\_

11

Zip  
Code:

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\_\_\_\_\_

[illegible]

Operator Point of Contact Information:

\_\_\_\_\_

||

\_\_\_\_\_

[illegible]

### III. Project/Site Information

\_\_\_\_\_

Project/Site Address:

[illegible]

\_\_\_\_\_

11

ZIP  
Code:[illegible]



**Low Erosivity Waiver Certification**

NPDES Form

Form Approved OMB No. 2040-0004

**Who May Qualify for a Low Erosivity Waiver**

Under the National Pollutant Discharge Elimination System (NPDES) Program, operators of construction projects that result in land disturbances equal to or greater than one acre, including sites that are less than one acre but are part of a larger common plan of development or sale where there is a cumulative disturbance of at least one acre, are required to obtain coverage under an NPDES permit for stormwater discharges associated with construction activity. EPA may waive the otherwise applicable permit requirements for stormwater discharges from construction activities that disturb less than five acres if the construction activity will take place during a period when the rainfall erosivity factor (R factor) is less than five. More information on the low erosivity waiver is available on the web in the Construction Rainfall Erosivity Waiver Fact Sheet at <https://www.epa.gov/npdes/construction-rainfall-erosivity-waiver-fact-sheet> and can be accessed from <https://www.epa.gov/npdes/rainfall-erosivity-factor-calculator-small-construction-sites>. For questions related to completion of this form, you may contact EPA's Notice of Intent Processing Center toll free at 1-866-352-7755.

**Completing the Form**

Type or print, using uppercase letters, in the appropriate areas only. Please place each character between the marks. Abbreviate if necessary to stay within the number of characters allowed for each item. Use only one space for breaks between words, but not for punctuation marks unless they are needed to clarify your response. **Please submit the original document with signature in ink - do not send a photocopied signature.**

**Section I. Approval to Use Paper Low Erosivity Waiver Form**

You must indicate whether you have been granted a waiver from electronic reporting from the EPA Regional Office. Note that you are not authorized to use this paper Low Erosivity Waiver form unless the EPA Regional Office has approved its use. Where you have obtained approval to use this form, indicate the waiver that you have been granted, the name of the EPA staff person who granted the waiver, and the date that approval was provided.

See <https://www.epa.gov/npdes/contact-us-stormwater#regional> for a list of EPA Regional Office contacts.

**Section II. Operator Information**

Each legal entity that meets EPA's definition of "operator" (see definitions in Appendix A of EPA's NPDES Construction General Permit) and that meets the eligibility conditions for the low erosivity waiver must file this form to have the permit requirements waived. The operator is any party associated with a construction activity that meets either of the following two criteria: (1) the party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or (2) the party has day-to-day operational control of those activities at a project that are necessary to ensure compliance with the permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the permit). It is possible that there will be more than one operator at a site and, in such cases, each entity that meets the operator definition must complete a Low Erosivity Waiver Certification. Provide the legal name of your firm, public organization, or other entity that operates the project described in this waiver certification. Usually this will be a company or organization's name but for construction activities undertaken by you as an individual, this should be your name.

Indicate whether you are seeking a waiver for permit coverage under this permit as a "federal operator" as defined in Appendix A.

Also provide the operator's mailing address, country, telephone number, and e-mail address for someone who can answer questions about the site (e.g., a project or site manager). Enter a point of contact (if different from the operator's name).

**Section III. Project/Site Information**

Enter the official or legal name and complete street address, including city, state, zip code, and county or similar government subdivision of the project or site. If the project lacks a street address, indicate the general location of the site (e.g., intersection of State Highways 61 and 34).

Provide the latitude and longitude of your facility in decimal degrees format. The latitude and longitude of your facility can be determined in several different ways, including through the use of global positioning system (GPS) receivers, U.S. Geological Survey (U.S.G.S.) topographic or quadrangle maps, and web-based siting tools, among others. For consistency, EPA requests that measurements be taken from the approximate center of the construction site. For linear construction sites, the measurement should be taken midpoint of the site. If known, enter the horizontal reference datum for your latitude and longitude. The horizontal reference datum is shown on the bottom left corner of USGS topographic maps; it is also available for GPS receivers.

Indicate whether the project is in Indian country lands or located on a property of religious or cultural significance to an Indian tribe, and if so, provide the name of the Indian tribe associated with the area of Indian country (including name of Indian reservation, if applicable), or if not in Indian country, provide the name of the Indian tribe associated with the property. Answer the other three questions on projects located in Oklahoma and Texas. This information is used to determine whether EPA is the permitting authority for the construction project, and thus has authority to waive the otherwise applicable requirements of the Construction General Permit.

Enter the area (estimated to the nearest quarter acre) to be disturbed including, but not limited to: grubbing, excavation, grading, and utilities and infrastructure installation. Note: 1 acre = 43,560 sq. ft.

**Section IV. Rainfall Erosivity Factor Calculation Data**

The construction period begins with the initial earth disturbance and ends with final site stabilization. To qualify for this waiver, the rainfall erosivity factor for the project must be less than five during the entire construction period. Specify the construction period by entering the project start date (date of initial earth disturbance) and project completion date (date of final site stabilization). For example, a grading contractor that is operating on-site for only one week during a nine month construction project, must enter the start date and completion date of the entire nine month construction period.

Where the environmental threat is low (i.e., in arid and semi-arid climates), "final stabilization" can include techniques that employ re-vegetation combined with other stabilization measures, consisting of temporary degradable rolled erosion control products, also known as "erosion control blankets (ECBs)". With proper selection, design, and installation of the combination re-vegetation/ECB technique in arid or semi-arid areas, an operator can be considered to have achieved final stabilization upon completion of the installation process. Note that if more than three years is required to establish 70 percent of the cover that is provided by vegetation native to local undisturbed area, this technique cannot be used or cited for fulfillment of the final stabilization requirement. If your waiver is based on use of interim non-vegetative stabilization measures, such as erosion control blankets, to establish the end of the construction

**Low Erosivity Waiver Certification****NPDES Form**

Form Approved OMB No. 2040-0004

period, you must indicate so on this form. In doing so, you must commit and certify (as a condition of waiver eligibility) to periodically inspect and properly maintain the area until the criteria for final stabilization, as defined in the Construction General Permit, have been met.

The rainfall erosivity factor "R" is determined in accordance with the U.S. Department of Agriculture *Agriculture Handbook Number 703, Predicting Soil Erosion by Water: A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE)*, Chapter 2 pages 21-64, dated January 1997. EPA's Construction Rainfall Erosivity Waiver Fact Sheet (EPA 833-F-00-014), available online at <https://www3.epa.gov/npdes/pubs/fact3-1.pdf> defines rainfall erosivity and provides numerical examples showing how to calculate your rainfall erosivity factor. You may use the fact sheet approach or the online rainfall erosivity factor calculator available at: <https://www.epa.gov/npdes/rainfall-erosivity-factor-calculator-small-construction-sites> to calculate your rainfall erosivity factor for your project.

If the R factor is five or greater during the project's construction period, you must have or obtain coverage under an NPDES stormwater permit. If the project was eligible for the waiver during the original construction period, but the construction activity will extend past the project completion date specified in the Low Erosivity Waiver Certification, the operator must recalculate the R factor using the original start date and a new project completion date. If the recalculated R factor is still less than five, a new waiver certification form must be submitted before the end of the original construction period. If the new R factor is five or greater, the operator must submit a Notice of Intent to be covered by the Construction General Permit before the original project completion date. The Notice of Intent (NOI) form may be submitted electronically using EPA's NPDES eReporting Tool (NeT) at <https://www.epa.gov/npdes/stormwater-discharges-construction-activities#ereporting>. If the EPA Regional Office grants you a waiver from electronic reporting, you may submit a paper NOI form available on the EPA website at <https://www.epa.gov/npdes/epas-2017-construction-general-permit-cgp-and-related-documents>.

**Section V. Certification Information**

All Low Erosivity Waiver Certification forms must be signed as follows:

*For a corporation:* By a responsible corporate officer. For the purpose of this Section, a responsible corporate officer means: (i) president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy-or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

*For a partnership or sole proprietorship:* By a general partner or the proprietor, respectively; or

*For a municipality, state, federal, or other public facility:* By either a principal executive officer or ranking elected official. For purposes

of this Section, a principal executive officer of a federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrator of EPA).

Include the name, title, and email address of the person signing the form and the signature date. An unsigned or undated Low Erosivity Waiver Certification will not be considered valid.

**Where to File This Form**

Low Erosivity Waiver Certification forms must be sent to one of the following two addresses.

**Regular U.S. Mail Delivery**

EPA Stormwater Notice  
Processing Center  
Mail Code 4203M  
Attn: 2017 CGP  
U.S. EPA  
1200 Pennsylvania Avenue, NW  
Washington, DC 20460

**Overnight/Express Mail Delivery**

EPA Stormwater Notice  
Processing Center  
Room 7420  
Attn: 2017 CGP  
U.S. EPA  
1201 Constitution Avenue, NW  
Washington, DC 20004

**Please submit the original form with a signature in ink. Do not send a photocopied signature!**

**Paperwork Reduction Act Notice**

Public reporting burden for this certification form is estimated to average 1.0 hours. This estimate includes time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. Send comments regarding the burden estimate, any other aspect of the collection of information, or suggestions for improving this form, including any suggestions which may increase or reduce this burden to: Chief, Information Strategies Branch (2822T), U.S. Environmental Protection, Agency, 1200 Pennsylvania Avenue, NW, Washington, D.C. 20460. Include the OMB control number on any correspondence. Do not send the completed form to this address.

## Appendix D - Eligibility Procedures Relating to Threatened and Endangered Species Protection

In accordance with Part 1.1.5 of the CGP, you must follow the procedures in this appendix to determine your eligibility under one of the criteria in Part D.1 of this appendix with respect to the protection of federally listed threatened or endangered species and federally designated "critical habitat" [hereinafter "threatened and endangered species"] under the Endangered Species Act (ESA) from discharges and discharge-related activities authorized under this permit. If you do not meet one of these criteria, you are not eligible for coverage under this permit.

While coordination between you and the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) (together, the "Services") is not necessarily required in all cases, EPA encourages you to coordinate with the Services, to document that coordination, and to do so early in the planning process prior to submitting your NOI.

This appendix is organized as follows:

- **Part D.1:** Threatened and Endangered Species Protection Eligibility Criteria
- **Part D.2:** Procedures for Determining Which Threatened and Endangered Species Protection Criteria Applies

### D.1 Threatened and Endangered Species Protection Eligibility Criteria

You must certify in your NOI that you meet one of the eligibility criteria listed below in order to be eligible for coverage under this permit. Once you determine the applicable eligibility criterion, you must:

- Specify the basis for your selection of the applicable eligibility criterion, and if required, provide documentation that is the basis for your determination with the NOI form; and
- Provide documentation in your SWPPP that is sufficient to support your determination that you satisfy the requirements of the applicable criterion.

The definition of "action area," which is contained in Appendix A, is repeated below for convenience.

"Action Area" – all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. For the purposes of this permit and for application of the Endangered Species Act requirements, the following areas are included in the definition of action area:

- The areas on the construction site where stormwater discharges originate and flow toward the point of discharge into the receiving waters (including areas where excavation, site development, or other ground disturbance activities occur) and the immediate vicinity. (Example: Where bald eagles nest in a tree that is on or bordering a construction site and could be disturbed by the construction activity or where grading causes stormwater to flow into a small wetland or other habitat that is on the site that contains listed species.)
- The areas where stormwater discharges flow from the construction site to the point of discharge into receiving waters. (Example: Where stormwater flows into a ditch, swale, or gully that leads to receiving waters and where listed species (such as listed amphibians) are found in the ditch, swale, or gully.)
- The areas where stormwater from construction activities discharge into receiving waters and the areas in the immediate vicinity of the point of discharge. (Example: Where stormwater from construction activities discharges into a stream segment that is known to harbor listed aquatic species.)
- The areas where stormwater controls will be constructed and operated, including any areas where stormwater flows to and from the stormwater controls. (Example: Where a stormwater retention pond would be built.)

**Criterion A.** No ESA-listed species and/or designated critical habitat present in action area. Using the process outlined in Appendix D of this permit, you certify that ESA-listed species and designated critical habitat(s) under the jurisdiction of the USFWS or NMFS are not likely to occur in your site's "action area" as defined in Appendix A of this permit.

**Basis statement content:** A basis statement supporting the selection of this criterion should identify the USFWS and NMFS information sources used. Attaching aerial image(s) of the site to this NOI is helpful to EPA, USFWS, and NMFS in confirming eligibility under this criterion. Please Note: NMFS' jurisdiction includes ESA-listed marine and estuarine species that spawn in inland rivers.

**Criterion B.** Eligibility requirements met by another operator under the 2017 CGP. The construction site's discharges and discharge-related activities were already addressed in another operator's valid certification of eligibility for your "action area" under eligibility Criterion A, C, D, E, or F of the 2017 CGP and you have confirmed that no additional ESA-listed species and/or designated critical habitat under the jurisdiction of USFWS and/or NMFS not considered in the that certification may be present or located in the "action area." To certify your eligibility under this criterion, there must be no lapse of NPDES permit coverage in the other CGP operator's certification. By certifying eligibility under this criterion, you agree to comply with any conditions upon which the other CGP operator's certification was based. You must include in your NOI the NPDES ID from the other 2017CGP operator's notification of authorization under this permit. If your certification is based on another 2017 CGP operator's certification under criterion C, you must provide EPA with the relevant supporting information required of existing dischargers in criterion C in your NOI form.

**Basis statement content:** A basis statement supporting the selection of this criterion should identify the eligibility criterion of the other CGP NOI, the authorization date, and confirmation that the authorization is effective.

**Criterion C.** Discharges not likely to adversely affect ESA-listed species and/or designated critical habitat. ESA-listed species and/or designated critical habitat(s) under the jurisdiction of the USFWS and/or NMFS are likely to occur in or near your site's "action area," and you certify to EPA that your site's discharges and discharge-related activities are not likely to adversely affect ESA-listed threatened or endangered species and/or designated critical habitat. This certification may include consideration of any stormwater controls and/or management practices you will adopt to ensure that your discharges and discharge-related activities are not likely to adversely affect ESA-listed species and/or designated critical habitat. To certify your eligibility under this criterion, indicate 1) the ESA-listed species and/or designated habitat located in your "action area" using the process outlined in Appendix D of this permit; 2) the distance between the site and the listed species and/or designated critical habitat in the action area (in miles); and 3) a rationale describing specifically how adverse effects to ESA-listed species will be avoided from the discharges and discharge-related activities. You must also include a copy of your site map from your SWPPP showing the upland and in-water extent of your "action area" with this NOI.

**Basis statement content:** A basis statement supporting the selection of this criterion should identify the information resources and expertise (e.g., state or federal biologists) used to arrive at this conclusion. Any supporting documentation should explicitly state that both ESA-listed species and designated critical habitat under the jurisdiction of the USFWS and/or NMFS were considered in the evaluation.

**Criterion D.** Coordination with USFWS and/or NMFS has successfully concluded. Coordination between you and the USFWS and/or NMFS has concluded. The coordination must have addressed the effects of your site's discharges and discharge-related activities on ESA-listed species and/or designated critical habitat under the jurisdiction of USFWS and/or NMFS, and resulted in a written concurrence from USFWS and/or NMFS that your site's discharges and discharge-related activities are not likely to adversely affect listed species and/or critical habitat. You must include copies of the correspondence with the participating agencies in your SWPPP and this NOI.

**Basis statement content:** A basis statement supporting the selection of this criterion should identify whether USFWS or NMFS or both agencies participated in coordination, the field office/regional office(s) providing that coordination, and the date that coordination concluded.

**Criterion E.** ESA Section 7 consultation has successfully concluded. Consultation between a Federal Agency and the USFWS and/or NMFS under section 7 of the ESA has concluded. The consultation must have addressed the effects of the construction site's discharges and discharge-related activities on ESA-listed species and/or designated critical habitat under the jurisdiction of USFWS and/or NMFS. To certify eligibility under this criterion, Indicate the result of the consultation:

- I. biological opinion from USFWS and/or NMFS that concludes that the action in question (taking into account the effects of your site's discharges and discharge-related activities) is not likely to jeopardize the continued existence of listed species, nor the destruction or adverse modification of critical habitat; or
- II. written concurrence from USFWS and/or NMFS with a finding that the site's discharges and discharge-related activities are not likely to adversely affect ESA-listed species and/or designated critical habitat.

You must include copies of the correspondence between yourself and the USFWS and/or NMFS in your SWPPP and this NOI.

**Basis statement content:** A basis statement supporting the selection of this criterion should identify the federal action agency(ies) involved, the field office/regional office(s) providing that consultation, any tracking numbers of identifiers associated with that consultation (e.g., IPaC number, PCTS number), and the date the consultation was completed.

**Criterion F.** Issuance of section 10 permit. Potential take is authorized through the issuance of a permit under section 10 of the ESA by the USFWS and/or NMFS, and this authorization addresses the effects of the site's discharges and discharge-related activities on ESA-listed species and designated critical habitat. You must include copies of the correspondence between yourself and the participating agencies in your SWPPP and your NOI.

**Basis statement content:** A basis statement supporting the selection of this criterion should identify whether USFWS or NMFS or both agencies provided a section 10 permit, the field office/regional office(s) providing permit(s), any tracking numbers of identifiers associated with that consultation (e.g., IPaC number, PCTS number), and the date the permit was granted.

You must comply with any applicable terms, conditions, or other requirements developed in the process of meeting the eligibility criteria in this section to remain eligible for coverage under this permit. Documentation of these requirements must be kept as part of your SWPPP (see Part 7.2.9.a).

NMFS will, within 14 days of submission of the NOI, advise EPA whether it believes the planned discharges meet the eligibility criteria of not likely to adversely affect NMFS Listed Resources of Concern, whether the eligibility criterion could be met with additional conditions; or whether the eligibility criterion is not met. With respects to ESA issues, EPA recognizes NMFS expertise and will carefully consider NMFS' determination in identifying eligibility for authorization, either with or without additional conditions. In the event NMFS has placed a hold on your NOI, EPA will notify you as to whether your discharges are authorized or whether an individual permit will be required. If you do not hear from EPA within 14 days, you may assume that your discharge is authorized without further conditions.

## **D.2 Procedures for Determining Which Threatened and Endangered Species Protection Criterion Applies**

You must follow the procedures in this Part to determine the criterion listed above under which your site is eligible for permit coverage.



**D.2.1 Step 1 - Determine if Your Discharges and Discharge-Related Activities Were Already Addressed in Another Operator's Valid Certification that Included Your Action Area.**

- **If your discharges and discharge-related activities were already addressed in another operator's valid certification that included your action area** (e.g., a general contractor or developer may have completed and filed an NOI for the entire action area with the necessary ESA certifications (Criterion A, C, D, E, or F)), *you may select eligibility Criterion B on your NOI form.*

By certifying eligibility under Criterion B, you must comply with any terms and conditions imposed under the eligibility requirements of the criterion for which the other operator has established eligibility (either Criterion A, C, D, E, or F) to ensure that your discharges and discharge-related activities are protective of listed species and/or critical habitat.

*Note: If you are unable to meet these eligibility requirements, then you may either establish eligibility under one of the other criterion, or you may consider applying to EPA for an individual permit.*

Under Criterion B, you must provide documentation in your SWPPP of any of these terms and conditions, as well as the other operator's basis for establishing eligibility. You must also provide a description of the basis for your selection of Criterion B on your NOI form, including the eligibility criterion (A, C, D, E, or F) that was certified to by the other operator, and must provide the NPDES ID from the other operator's notification of authorization under this permit.

If your certification is based on another operator's certification under criterion C, you must provide the documentation required in the NOI for criterion C, namely: 1) what federally listed species and/or designated habitat are located in your "action area"; and 2) the distance between your site and the listed species or designated critical habitat (in miles).

- **If discharges and discharge-related activities from your site were not addressed in another operator's valid certification that included your action area**, you must follow the applicable procedures in Steps 2 through 5 below.

**D.2.2 Step 2 - Determine if Listed Threatened or Endangered Species or their Designated Critical Habitat(s) are Likely to Occur in your Site's Action Area**

You must determine, to the best of your knowledge, whether species listed as either threatened or endangered, or their critical habitat(s) (see definitions of these terms in Appendix A), are located in your site's action area. To make this determination, you should first determine if listed species and/or critical habitat are expected to exist in your county or township. The U.S. Fish and Wildlife Service and National Marine Fisheries Service maintain lists of federally listed endangered or threatened species on their internet sites.

- For National Marine Fisheries Service species and critical habitat information, use the following webpages, which provide up-to-date information on listed species (<http://www.nmfs.noaa.gov/pr/species/esa/>) and critical habitat (<http://www.nmfs.noaa.gov/pr/species/criticalhabitat.htm>). To determine the field office that corresponds to your site, go to <http://www.nmfs.noaa.gov/> (under the left tab for "Regions").

For National Marine Fisheries Service species in the Greater Atlantic Region, go to <https://www.greateratlantic.fisheries.noaa.gov/protected/index.html>.

- For Fish and Wildlife Service species information, use the on-line mapping tool IPaC (the Information, Planning, and Consultation System) located at <http://ecos.fws.gov/ipac/>, and follow these steps:
  - Select Get Started
  - Select Enter Project Location
  - Use an address, city name or other location to zoom into your project area
  - Use the zoom feature to see the entire extent of your action area on the screen
  - Use one of the mapping features (e.g., Polygon or line feature) to draw your action
- When you are done, press *Continue*.
- Select Request an Official Species List
- Complete the fields on the Official Species List Request page, and include "(CGP)" at the end of the project description. – For Classification, select "Water Quality Modification".
- Select the appropriate requesting agency/organization type (for most dischargers, this should be "Other").
- Submit the request to acquire an Official Species List, which should show both listed species as well as any designated critical habitat that are present in the action area in the previous step.
- *Note: If a link to an Official Species List is not available on the page, follow the web link of the office(s) indicated, or contact the office directly by mail or phone if a web link is not shown.*
- ***If listed species and/or critical habitat may exist in your action area, you must do one or more of the following:***
  - Conduct visual inspections. This method may be particularly suitable for construction sites that are smaller in size or located in non-natural settings such as highly urbanized areas or industrial parks where there is little or no natural habitat, or for construction activities that discharge directly into municipal stormwater collection systems.
  - Conduct a formal biological survey. In some cases, particularly for larger construction sites with extensive stormwater discharges, biological surveys may be an appropriate way to assess whether species are located in the action area and whether there are likely to be adverse effects to such species. Biological surveys are frequently performed by environmental consulting firms.
  - If required, conduct an environmental assessment under the National Environmental Policy Act (NEPA). Some construction activities might require review under NEPA for specific reasons, such as federal funding or other federal involvement in the project. Note: Coverage under the CGP does not trigger such a review for individual projects/sites. EPA has complied with NEPA in the issuance of the CGP.

**and**

- Follow the instructions in Steps 3 – 5 below, as applicable. Note that many but not all measures imposed to protect listed species under these steps will also protect critical habitat. Thus, meeting the eligibility requirements of this CGP may require measures to protect critical habitat that are separate from those to protect listed species.
- **If there are no listed species and no critical habitat areas in your action area**, you may check *eligibility criterion A* on your NOI form. You must also provide a description of the basis for the criterion selected on your NOI form and provide documentation supporting the criterion selected in your SWPPP.

**D.2.3 Step 3 - Determine if the Construction Activity's Discharges or Discharge-Related Activities Are Likely to Adversely Affect Listed Threatened or Endangered Species or Designated Critical Habitat**

If in Step 2 you determine that listed species and/or critical habitat could exist in your action area, you must next assess whether your discharges or discharge-related activities are likely to adversely affect listed threatened or endangered species or designated critical habitat.

Potential adverse effects from discharges and discharge-related activities include:

- *Hydrological.* Stormwater discharges may cause siltation, sedimentation, or induce other changes in receiving waters such as temperature, salinity, or pH. These effects will vary with the amount of stormwater discharged and the volume and condition of the receiving water. Where a stormwater discharge constitutes a minute portion of the total volume of the receiving water, adverse hydrological effects are less likely. Construction activity itself may also alter drainage patterns on a site where construction occurs that can impact listed species or critical habitat.
- *Habitat.* Excavation, site development, grading, and other surface disturbance activities from construction activities, including the installation or placement of stormwater controls, may adversely affect listed species or their habitat. Stormwater may drain or inundate listed species habitat.
- *Toxicity.* In some cases, pollutants in stormwater may have toxic effects on listed species.

The scope of effects to consider will vary with each site. If you are having difficulty determining whether your project is likely to adversely affect listed species or critical habitat, or one of the Services has already raised concerns to you, you should contact the appropriate Services office for assistance.

- **If adverse effects to listed threatened or endangered species or their critical habitat are not likely**, then you may select *eligibility criterion C* on the NOI form. You must provide the following specific information on your NOI form: 1) the federally listed species and/or designated habitat are located in your "action area"; and 2) the distance between your site and the listed species or designated critical habitat (in miles). You must also provide a copy of your site map with your NOI.
- **If adverse effects to listed threatened or endangered species or their critical habitat are likely**, you must follow Step 4 below.

**D.2.4 Step 4 - Determine if Measures Can Be Implemented to Avoid Adverse Effects**

If you make a preliminary determination in Step 3 that adverse effects from your construction activity's discharges or discharge-related activities are likely to occur, you can still receive coverage under eligibility criterion C of the CGP if appropriate measures are undertaken to avoid or eliminate the likelihood of adverse effects prior to applying for CGP coverage.

These measures may involve relatively simple changes to construction activities such as re-routing a stormwater discharge to bypass an area where species are located, relocating stormwater controls, or by modifying the "footprint" of the construction activity. If you are unable to ascertain which measures to implement to avoid the likelihood of adverse effects, you must coordinate or enter into consultation with the Fish and Wildlife Service and/or National Marine Fisheries Service, in which case you would not be eligible for coverage under eligibility criterion C, but may instead be eligible for coverage under eligibility criterion D, E, or F (described in more detail in Step 5).

- **If you are able to install and implement appropriate measures to avoid the likelihood of adverse effects**, then you may check eligibility criterion C on the NOI form. The measures you adopt to avoid or eliminate adverse effects must be implemented for the duration of the construction project and your coverage under the CGP. You must also provide a description of the basis for the criterion selected, and the following specific information on your NOI form: 1) the federally listed species and/or designated habitat are located in your "action area"; and 2) the distance between your site and the listed species or designated critical habitat (in miles).
- **If you cannot ascertain which measures to implement to avoid the likelihood of adverse effects**, you must follow the procedures in Step 5.

**D.2.5 Step 5 - Determine if the Eligibility Requirements of Criterion D, E, or F Can Be Met**

If in Step 4 you cannot ascertain which measures to implement to avoid the likelihood of adverse effects, you must contact the Fish and Wildlife Service and/or the National Marine Fisheries Service. You may still be eligible for CGP coverage if likely adverse effects can be addressed through meeting criterion D, E, or F.

- **Criterion D:** Coordination between you and the Services has concluded. The coordination must have addressed the effects of your site's discharges and discharge-related activities on federally-listed threatened or endangered species and federally-designated critical habitat, and resulted in a written concurrence from the relevant Service(s) that your site's discharges and discharge-related activities are not likely to adversely affect listed species or critical habitat.  
  
If you have met the requirements of criterion D, you may select eligibility criterion D on the NOI form. You must provide a description of the basis for the criterion selected on your NOI form and must include copies of the correspondence between you and the applicable Service in your SWPPP.
- **Criterion E:** Consultation between a Federal Agency and the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service under section 7 of the ESA has concluded. The consultation must have addressed the effects of the construction site's discharges and discharge-related activities on federally-listed threatened or endangered species and federally-designated critical habitat. The result of this consultation must be either (1) a biological opinion that concludes that the action in question (taking into account the effects of your site's discharges and discharge-related activities) is not likely to jeopardize the

continued existence of listed species, nor the destruction or adverse modification of critical habitat; or (2) written concurrence from the applicable Service(s) with a finding that the site's discharges and discharge-related activities are not likely to adversely affect federally-listed species or federally-designated habitat.

For more information on section 7 consultation, see 50 CFR §402. If you receive a "jeopardy opinion," you may continue to work with the Fish and Wildlife Service and/or National Marine Fisheries Service and your permitting authority to modify your project so that it will not jeopardize listed species or designated critical habitat.

Note that most consultations are accomplished through informal consultation. When conducting informal ESA section 7 consultation as a non-federal representative, you must follow the procedures found in 50 CFR Part 402 of the ESA regulations. You must notify the Services of your intention and agreement to conduct consultation as a non-federal representative.

Consultation may also occur in the context of another federal action at the construction site (e.g., where ESA section 7 consultation was performed for issuance of a wetlands dredge and fill permit for the project or where a NEPA review is performed for the project that incorporates a section 7 consultation).

Any terms and conditions developed through consultations to protect listed species and critical habitat must be incorporated into the SWPPP. As noted above, operators may, if they wish, initiate consultation with the Services at Step Four.

Whether ESA section 7 consultation must be performed with either the Fish and Wildlife Service, National Marine Fisheries Service, or both Services depends on the listed species that may be affected by the operator's activity. In general, the National Marine Fisheries Service has jurisdiction over marine, estuarine, and anadromous species. Operators should also be aware that while formal section 7 consultation provides protection from incidental takings liability, informal consultation does not.

If you have met the requirements of criterion E, *you may select eligibility criterion E on the NOI form*. You must provide a description of the basis for the criterion selected on your NOI form and must include copies of the correspondence between yourself and the Services in your SWPPP.

- **Criterion F:** Your construction activities are authorized through the issuance of a permit under section 10 of the ESA, and this authorization addresses the effects of the site's discharges and discharge-related activities on federally-listed species and federally-designated critical habitat.

You must follow Fish and Wildlife Service and/or National Marine Fisheries Service procedures when applying for an ESA section 10 permit (see 50 CFR §17.22(b)(1) for Fish and Wildlife Service and §222.22 for National Marine Fisheries Service). Application instructions for section 10 permits can be obtained from <http://www.fws.gov> and <http://www.nmfs.noaa.gov> or by contacting the appropriate Service office.

If you have met the requirements of criterion F, *you may select eligibility criterion F on the NOI form*. You must provide a description of the basis for the criterion selected on your NOI form and must include copies of the correspondence between yourself and the Services in your SWPPP.

## Appendix E – Historic Property Screening Process

### Background

Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to take into account the effects of Federal “undertakings”, such as the issuance of this permit, on historic properties that are either listed on, or eligible for listing on, the National Register of Historic Places. To address any issues relating to historic properties in connection with the issuance of this permit, EPA developed the screening process in this appendix that enables construction operators to appropriately consider the potential impacts, if any, of their installation of stormwater controls on historic properties and to determine whether actions can be taken, if applicable, to mitigate any such impacts. Although the coverages of individual construction sites under this permit do not constitute separate Federal undertakings, the screening process in this appendix provides an appropriate site-specific means of addressing historic property issues in connection with EPA’s issuance of the permit.

#### Key Terms

**Historic property**- prehistoric or historic districts, sites, buildings, structures, or objects that are included in or eligible for inclusion in the National Register of Historic Places, including artifacts, records, and remains that are related to and located within such properties

**SHPO** – The State Historic Preservation Officer for a particular state

**THPO or Tribal representative** – The Tribal Historic Preservation Officer for a particular tribe or, if there is no THPO, the representative designated by such tribe for NHPA purposes

### Instructions for All Construction Operators

You are required to follow the screening process in this appendix to determine if your installation of stormwater controls on your site has the potential to cause effects to historic properties, and whether or not you need to contact your SHPO, THPO, or other tribal representative for further information. **You may not submit your NOI until you have completed this screening process.** The following four steps describe how applicants can meet the historic property requirements under this permit:

Step 1      *Are you installing any stormwater controls that require subsurface earth disturbance?*<sup>1</sup>

The first step of the screening process is to determine if you will install stormwater controls that cause subsurface earth disturbance. The installation of the following types of stormwater controls require subsurface earth disturbance:<sup>2</sup>

- Dikes
- Berms
- Catch Basins
- Ponds
- Ditches

<sup>1</sup> You are only required to consider earth-disturbing activities related to the installation of stormwater controls in the NHPA screening process. You are not required to consider other earth-disturbing activities at the site. If you are installing one of the above stormwater controls or another type of control that requires subsurface earth disturbance, your stormwater controls have the potential to have an effect on historic properties. If this is the case, then you must proceed to Step 2.

<sup>2</sup> This list is not intended to be exhaustive. Other stormwater controls that are not on this list may involve earth-disturbing activities and must also be examined for the potential to affect historic properties.

- Trenches
- Culverts
- Channels
- Perimeter Drains
- Swales

If you are not installing one of the above stormwater controls or another type of control that requires subsurface earth disturbance, then you may indicate this on your NOI, and no further screening is necessary. During the 14-day waiting period after submitting your NOI, the SHPO, THPO, or other tribal representative may request that EPA hold up authorization based on concerns about potential adverse effects to historic properties. EPA will evaluate any such request and notify you if any additional controls to address adverse effects to historic properties are necessary.

Step 2      *Have prior professional cultural resource surveys or other evaluations determined that historic properties do not exist, or have prior disturbances precluded the existence of historic properties?*

If you are installing a stormwater control that requires subsurface earth disturbance, you must next determine if no historic properties exist on your site based on prior professional cultural resource surveys or other evaluations, or if the existence of historic properties has been precluded because of prior earth disturbances.

If prior to your project it has already been determined that no historic properties exist at your site based on available information, including information that may be provided by your applicable SHPO, THPO, or other tribal representative, then you may indicate this on your NOI, and no further screening steps are necessary. Similarly, if prior earth disturbances have eliminated the possibility that historic properties exist on your site, you may indicate this on your NOI, and no further screening steps are necessary. After submitting your NOI, and during the 14-day waiting period, the SHPO, THPO, or other tribal representative may request that EPA hold up authorization based on concerns about potential adverse effects to historic properties. EPA will evaluate any such request and notify you if any additional measures to address adverse effects to historic properties are necessary.

If neither of these circumstances exists for your project, you must proceed to Step 3.

Step 3      *If you are installing any stormwater controls that require subsurface earth disturbance, you must determine if these activities will have an effect on historic properties.*

If your answer to the question in Step 2 is "no", then you must assess whether your earth-disturbing activities related to the installation of stormwater controls will have an effect on historic properties. This assessment may be based on historical sources, knowledge of the area, an assessment of the types of earth-disturbing activities you are engaging in, considerations of any controls and/or management practices you will adopt to ensure that your stormwater control-related earth-disturbing activities will not have an effect on historic properties, and any other relevant factors. If you determine based on this assessment that earth disturbances related to the installation of your stormwater controls will have no effect on historic properties, you may indicate this on your NOI, and document the basis for your determination in your SWPPP, and no further screening steps are necessary. After submitting your NOI, and during the 14-day waiting period, the SHPO, THPO, or other tribal representative may request that EPA hold up authorization based on concerns about potential adverse effects to historic properties. EPA will evaluate any such request and notify you if any additional measures to address adverse effects to historic properties are necessary.

If none of the circumstances in Steps 1 - 3 exist for your project, you must proceed to Step 4.

**Step 4:** *If you are installing any stormwater controls that require subsurface earth disturbance and you have not satisfied the conditions in Steps 1 - 3, you must contact and consult with the appropriate historic preservation authorities.*

Where you are installing stormwater controls that require subsurface earth disturbance, and you cannot determine in Step 3 that these activities will have no effect on historic properties, then you must contact the relevant SHPO, THPO, or other tribal representative to request their views as to the likelihood that historic properties are potentially present on your site and may be impacted by the installation of these controls.

*Note: Addresses for SHPOs and THPOs may be found on the Advisory Council on Historic Preservation's website ([www.achp.gov/programs.html](http://www.achp.gov/programs.html)). If a tribe does not have a THPO, you should contact the appropriate tribal government office designated by the tribe for this purpose.*

You must submit the following minimum information in order to properly initiate your request for information:

1. Project name (i.e., the name or title most commonly associated with your project);
2. A narrative description of the project;
3. Name, address, phone and fax number, and email address (if available) of the operator;
4. Most recent U.S. Geological Survey (USGS) map section (7.5 minute quadrangle) showing actual project location and boundaries clearly indicated; and
5. Sections of the SWPPP site map (see Part 7.2.4) that show locations where stormwater controls that will cause subsurface earth disturbance will be installed (see Step 1).

Without submitting this minimum information, you will not have been considered to have properly initiated your request. You will need to provide the SHPO, THPO, or other tribal representative **a minimum of 15 calendar days** after they receive these materials to respond to your request for information about your project.

If you do not receive a response within 15 calendar days after receipt by the SHPO, THPO, or other tribal representative of your request, then you may indicate this on your NOI, and no further screening steps are necessary. Or, if the applicable SHPO, THPO, or other tribal representative responds to your request with an indication that no historic properties will be affected by the installation of stormwater controls at your site, then you may indicate this on your NOI, and no further screening steps are necessary. After submitting your NOI, and during the 14-day waiting period, the SHPO, THPO, or other tribal representative may request that EPA hold up authorization based on concerns about potential adverse effects to historic properties. EPA will evaluate any such request and notify you if any additional measures to address adverse effects to historic properties are necessary.

If within 15 calendar days of receipt of your request the applicable SHPO, THPO, or other tribal representative responds with a request for additional information or for further consultation regarding appropriate measures for treatment or mitigation of effects on historic properties caused by the installation of stormwater controls on your site, you must comply with this request and proceed to Step 5.

**Step 5:** *Consultation with your applicable SHPO, THPO, or other tribal representative.*

If, following your discussions with the appropriate historic preservation authorities in Step 4, the applicable SHPO, THPO, or tribal representative requests additional information or further consultation, you must respond with such information or consult to determine impacts to historic properties that may be caused by the installation of stormwater controls on your site and appropriate measures for treatment or mitigation of such impacts. If as a result of your



discussions with the applicable SHPO, THPO, or tribal representative, you enter into, and comply with, a written agreement regarding treatment and/or mitigation of impacts on your site, then you may indicate this on your NOI, and no further screening steps are necessary.

If, however, agreement on an appropriate treatment or mitigation plan cannot be reached between you and the SHPO, THPO, or other tribal representative within 30 days of your response to the SHPO, THPO, or other tribal representative's request for additional information or further consultation, you may submit your NOI, but you must indicate that you have not negotiated measures to avoid or mitigate such effects. You must also include in your SWPPP the following documentation:

1. Copies of any written correspondence between you and the SHPO, THPO, or other tribal representative; and
2. A description of any significant remaining disagreements as to mitigation measures between you and the SHPO, THPO, or other tribal representative.

After submitting your NOI, and during the 14-day waiting period, the SHPO, THPO, ACHP or other tribal representative may request that EPA place a hold on authorization based upon concerns regarding potential adverse effects to historic properties. EPA, in coordination with the ACHP, will evaluate any such request and notify you if any additional measures to address adverse effects to historic properties are necessary.

## Appendix F - List of Tier 3, Tier 2, and Tier 2.5 Waters

EPA's CGP has special requirements for discharges to waters that receive Tier 2, Tier 2.5, or Tier 3 protections for antidegradation purposes. See Parts 1.1.8 and 3.2.

EPA's antidegradation regulation, at 40 CFR 131.12, provides a framework for maintaining and protecting water quality for: (1) existing uses (known as "Tier 1"); (2) high quality waters by establishing a process for authorizing the lowering of water quality where existing water quality exceeds levels needed to support propagation of fish, shellfish, and wildlife and recreation in and on the water (known as "Tier 2"); and (3) for Outstanding National Resource Waters (known as "Tier 3"). While EPA's antidegradation regulation only outlines three levels of antidegradation protection, some states and tribes include an additional level of antidegradation protection between Tier 2 and Tier 3 (sometimes known as "Tier 2.5").

High quality (Tier 2) waters may be identified on a parameter-by-parameter basis or on a water body-by-water body basis consistent with the requirements of 40 CFR 131.12(a)(2). States and tribes using a parameter-by-parameter basis (sometimes called a "pollutant-by-pollutant approach") do not maintain a list of Tier 2 waters, but instead identify a high quality water at the time an entity proposes an activity that would lower water quality. In contrast, states and tribes using a water body-by-water body basis typically identify high quality waters in advance on a list by weighing a variety of factors (e.g., chemical, physical, biological, and other information) to classify a water body's overall quality.

The list below is provided as a resource for operators who must determine whether they discharge to a Tier 2, Tier 2.5, or Tier 3 water. Where available, the table lists waters specifically identified for Tier 2, Tier 2.5, or Tier 3 protection by a water quality standard authority (e.g., a state or tribe). Operators should not assume that a water does not receive Tier 2, Tier 2.5, or Tier 3 protection solely based on the absence of information in this table. Evaluation regarding antidegradation protections for a specific water may need to be done on a case-by-case basis, especially where the state or tribe uses the parameter-by-parameter approach to identify whether water quality is better than necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water.

| Permit Number | Areas of Coverage/Where EPA Is Permitting Authority   |  |
|---------------|---|--|
| MAR100000     | <b>Commonwealth of Massachusetts, except Indian Country lands</b>   |  |
|               | Tier 2, Tier 2.5, and 3 waters are identified and listed in the Massachusetts Water Quality Standards 314 CMR 4.00. Surface water qualifiers that correspond with Tier classifications are defined at 314 CMR 4.06(1)(d)m and listed in tables and figures at the end of 314 CMR 4.06. See MassDEP's web page at: <a href="http://www.mass.gov/eea/agencies/massdep/water/regulations/314-cmr-4-00-mass-surface-water-quality-standards.html">http://www.mass.gov/eea/agencies/massdep/water/regulations/314-cmr-4-00-mass-surface-water-quality-standards.html</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-massachusetts">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-massachusetts</a> |  |
|               | Tier 2  | Listed as "High Quality Waters", and all wetlands that are not designated as an Outstanding Resource Water.  |
|               | Tier 2.5  | Listed as "Outstanding Resource Water", "Public Water Supply", "Tributary to Public Water Supply", all wetlands bordering Outstanding Resource Waters, and vernal pools. |
|               | Tier 3  | Defined as "Special Resource Water". Note: No waters have been identified as a Special Resource Water as of the issuance of this permit.                                 |

| Permit Number | Areas of Coverage/Where EPA Is Permitting Authority  |  |
|---------------|--|--|
| NHR100000     | <b>State of New Hampshire</b>  |  |
|               | Tier 2 waters are identified on a parameter-by-parameter basis. Tier 2.5 and 3 waters are identified and listed in the New Hampshire Water Quality Standards CHAPTER Env-Wq 1700. Description of the antidegradation tiers are included at CHAPTER Env-Wq 1708 and listed in the tables at. New dischargers and new sources should contact EPA Region 1's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-new-hampshire">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-new-hampshire</a>  |  |
| NYR101000     | <b>Saint Regis Mohawk Tribe (NY)</b>   |  |
|               | Tier 2 waters are identified on a parameter-by-parameter basis. There is not a Tier 2.5 classification identified in the Saint Regis Mohawk Tribe Water Quality Standards. New dischargers and new sources should contact EPA Region 2's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See: <a href="https://www.epa.gov/sites/production/files/2014-12/documents/stregis-tribe.pdf">https://www.epa.gov/sites/production/files/2014-12/documents/stregis-tribe.pdf</a>  |  |
|               | Tier 3<br>Outstanding Resource Waters. Those waters designated as such by the Tribe. The Waters that may be considered for designation as Outstanding Resource Waters include, but are not limited to, water bodies that are recognized as: (i) Important because of protection through official action, such as Tribal, Federal or State law, Presidential or secretarial action, international treaty, or interstate compact; (ii) Having exceptional recreational significance; (iii) Having exceptional ecological significance; (iv) Having other special environmental, recreational, religious or ecological attributes; or waters whose designation as Outstanding Resource Waters is reasonably necessary for the protection of other waters so designated. New dischargers and new sources should contact EPA Region 2's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . |  |

| Permit Number | Areas of Coverage/Where EPA Is Permitting Authority  |  |
|---------------|--|--|
| PRR100000     | <b>Commonwealth of Puerto Rico</b>   |  |
|               | Tier 2 waters are identified on a parameter-by-parameter basis. There is not a Tier 2.5 classification identified in the Puerto Rico Water Quality Standards. New dischargers and new sources should contact EPA Region 2's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-puerto-rico">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-puerto-rico</a>   |  |
|               | Tier 3   | Tier III waters are those which are classified as either Class SA or Class SE. Class SA waters are defined as "Coastal waters and estuarine waters of high quality and/or exceptional ecological or recreational value whose existing characteristics shall not be altered, except by natural causes, in order to preserve the existing natural phenomena." Class SA waters include bioluminescent lagoons and bays such as La Parguera and Monsio José on the Southern Coast, Bahía de Mosquito in Vieques, and any other coastal or estuarine waters of exceptional quality of high ecological value or recreational which may be designated by Puerto Rico, through Resolution, as requiring this classification for protection of the waters. Class SE waters are defined as "Surface waters and wetlands of exceptional ecological value, whose existing characteristics should not be altered in order to preserve the existing natural phenomena." Class SE waters include Laguna Tortuguero, Laguna Cartagena and any other surface water bodies of exceptional ecological value as may be designated by Puerto Rico through Resolution. |
| DCR100000     | <b>District of Columbia</b>  |  |
|               | New dischargers and new sources should contact EPA Region 3's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . Tier 2.5 waters are identified and listed in the District of Columbia Water Quality Standards. See: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-washington-dc">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-washington-dc</a>  |  |
|               | Tier 2.5   | Rule 1102.4 SPECIAL WATERS OF THE DISTRICT OF COLUMBIA (SWDC): Any segment or segments of the surface waters of the District that are of water quality better than needed for the current use or have scenic or aesthetic importance shall be designated as Special Waters of the District of Columbia (SWDC). Rock Creek and its tributaries and Battery Kemble Creek and its tributaries are considered Special Waters of the District of Columbia (SWDC) under its antidegradation program.   |
| FLR101000     | <b>Miccosukee Tribe (FL)</b>   |  |
|               | New dischargers and new sources should contact EPA Region 4's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . The Miccosukee Tribe Water Quality Standards includes an additional tier of protection between Tier 2 and 3 that is referred as Tier 2 ¾ for Outstanding Miccosukee Waters. See: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-miccosukee-tribe-indians-florida">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-miccosukee-tribe-indians-florida</a> |  |

| Permit Number | Areas of Coverage/Where EPA Is Permitting Authority   |   |
|---------------|---|---|
|               | Tier 2 $\frac{3}{4}$  | <p>Outstanding Miccosukee Waters (OMW): The Miccosukee Tribe recognizes that the waters of its Federal Reservation which are contained within Water Conservation Area 3-A and the Miccosukee Reserved Area constitute the Tribe's highest quality waters and must be preserved in as pristine a condition as possible while at the same time allowing for the activities of man. These ecologically important waters are essential to the survival of the Miccosukee Tribe, therefore: The Miccosukee Tribe hereby designates the waters of its Federal Reservation which are contained within Water Conservation Area 3-A (North Grass, South Grass, Gap) and Miccosukee Reserved Area as Class III-A and Outstanding Miccosukee waters (OMW). The North Grass is defined as that area bounded by the northern boundary of the reservation, the eastern edge of the L-28 levee (which is east of the L-28 canal), the southern edge of the C-60 Canal, and the eastern boundary of the reservation. The South Grass is defined as the area bounded by southern edge of the C-60 canal, the eastern boundary of the reservation, the southern boundary of the reservation, the eastern edge of the L-28 canal (which is south of the L-28 Tieback Canal), a line running north from the L-28 Canal (where the L-28 Canal turns northwest to become the L-28 Tieback Canal) until this line intersects the oil pipeline, the center of the oil pipeline until the oil pipeline intercepts the L-28 Interceptor Canal, and the eastern edge of the L-28 levee (which is east of the L-28 Canal). The Gap is defined as that area which is bounded by the southern boundary of the reservation, the western boundary of the reservation, the northeastern edge of the L-28 Interceptor Canal, the oil pipeline which runs generally south from the L-28 Interceptor Canal until the pipeline intercepts a line running north from the L-28 Canal where the L-28 canal turns northwest to become the L-28 Tieback Canal, and the eastern edge of the L-28 canal (which is south of the L-28 Tieback Canal).</p> |
|               | Tier 3  | <p>Tier 3: Outstanding Natural Resource Waters (ONRW): Where high quality waters constitute an Outstanding Tribal resource such as waters of parks and wildlife refuges and waters of exceptional ecological and recreational significance, that water quality shall be maintained and protected. These waters shall be designated as Outstanding Natural Resource Waters (ONRW). Currently, no Tribal waters are designated as ONRW.</p>   |
|               | <b>Seminole Tribe (FL)</b>  |   |
|               | <p>New dischargers and new sources should contact EPA Region 4's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a>. See also: <a href="https://www.epa.gov/sites/production/files/2014-12/documents/seminole_floridawqs.pdf">https://www.epa.gov/sites/production/files/2014-12/documents/seminole_floridawqs.pdf</a></p> |   |

| Permit Number | Areas of Coverage/Where EPA Is Permitting Authority  |  |
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| MNR10I000     | <b>Fond du Lac Band of MN Chippewa</b>   |  |
|               | Tier 2 waters are identified on a parameter-by-parameter basis. There is not a Tier 2.5 classification identified in the Fond du Lac Band of MN Chippewa Water Quality Standards. New dischargers and new sources should contact EPA Region 5's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-fond-du-lac-band-minnesota-chippewa-tribe">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-fond-du-lac-band-minnesota-chippewa-tribe</a>   |  |
|               | Tier 3   | Six Lakes are presently identified as Tier 3/Outstanding Reservation Resource Waters (ORRW): (1) Dead Fish Lake; (2) Jaskari Lake; (3) Miller (Mud) Lake; (4) Perch Lake; (5) Rice Portage Lake; (6) Wild Rice Lake.   |
|               | <b>Grand Portage Band of MN Chippewa</b>   |  |
|               | Tier 2 waters are identified on a parameter-by-parameter basis. Two subcategories of protection (referred to as outstanding tribal water resource (OTWR)) exist in the Grand Portage Band of MN Chippewa Water Quality Standards as follows: (a) OTWR-Restricted (lowered water quality may be allowed under limited circumstances); (b) OTWR-Prohibited (Discharges and permanent lowering of water quality are prohibited). New dischargers and new sources should contact EPA Region 5's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-grand-portage-band-minnesota-chippewa-tribe">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-grand-portage-band-minnesota-chippewa-tribe</a> |  |
|               | Tier 2   | OTWR-Restricted: All waters, not already classified as Tier 3, are high quality Tier 2 waters (see Grand Portage Reservation Water Quality Standards, Section VI & VII, Pages 14-16).  |
| WIR10I000     | Tier 3   | OTWR-Prohibited: "The portion of Lake Superior north of latitude 47 degrees, 57 minutes, 13 seconds, east of Hat Point, south of the Minnesota-Ontario boundary, and west of the Minnesota-Michigan boundary" (see Section VII, Page 16).                          |
|               | <b>Bad River Band of Lake Superior Chippewa (WI)</b>   |  |
|               | Tier 2 waters are identified on a water body-by-water body basis. Tier 2, 2.5, and 3 classifications are included in the Bad River Band of Lake Superior Chippewa Water Quality Standards. See: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-bad-river-band-lake-superior-chippewa-tribe">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-bad-river-band-lake-superior-chippewa-tribe</a>  |  |
|               | Tier 2   | Any surface water not specifically classified as Outstanding Tribal Resource Water or Outstanding Resource Water is classified as Exceptional Resource Water (Anishinaabosibiing).   |
|               | Tier 2.5   | Outstanding Resource Waters: a portion of Bad River, from downstream the confluence with the White River to Lake Superior, White River, Marengo River, Graveyard Creek, Bear Trap Creek, Wood Creek, Brunsweller River, Tyler Forks, Bell Creek, and Vaughn Creek. |

| Permit Number | Areas of Coverage/Where EPA Is Permitting Authority  |  |
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|               | Tier 3   | Outstanding Tribal Resource Waters: Kakagon Slough and the lower wetland reaches of its tributaries that support wild rice, Kakagon River, Bad River Slough, Honest John Lake, Bog Lake, a portion of Bad River, from where it enters the Reservation through the confluence with the White River, and Potato River.   |
|               | <b>Lac du Flambeau Band of the Lake Superior Chippewa</b>  |  |
|               | Tier 2 waters are identified on a water body-by-water body basis. Tier 2, 2.5, and 3 classifications are included in the Lac du Flambeau Band of the Lake Superior Chippewa Water Quality Standards. See:<br><a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-lac-du-flambeau-band-lake-superior-chippewa-tribe">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-lac-du-flambeau-band-lake-superior-chippewa-tribe</a> |  |
|               | Tier 2   | All named waters, including wetlands, not specified under an Antidegradation classification are classified as Tribal Resource Water (Tier 2). Unclassified Named Waters (Tier 2): Buckskin Lake; Flambeau Lake; Long (Interlaken) Lake; Marland's Lake (Sec. 13, T40NR4E); Moss Lake; Pokegema Lake.   |
|               | Tier 2.5   | Exceptional Tribal Resource Waters: Bills Lake, Birch Lake, Bobidosh Lake, Bog Lake (SE SE Sec. 31, T40NR6E), Bolton Lake, Broken Bow Lake, Chewalah Lake, Clear Lake (Sec. 2, T39NR4E), Corn Great, Great, Corn Lake, Little "Least/Lesser", Crawling Stone Lake, Big, Crawling Stone Lake, Little, Crescent Lake, Crooked Lake, Big, David Lake, Ellerson Lake, Middle, Ellerson Lake, West, Elsie Lake "Boundary Lake", Fat Lake, Fence Lake, Gresham Creek, Green Lake (NW NW Sec. 19, T41R6E), Grey Lake, Gunlock Lake, Haskell Lake, Headflyer Lake (Sec. 19, T41NR5E), Highway Lake (NW NW Sec. 19, T41NR5E), Horsehead Lake (SE SW Sec. 9, T40NR5E), Hutton's Creek, Ike Walton Lake, Lily Lake (SE SW Sec. 35, T40NR5E), Little Ten Lake, Lodge Lake "L. Rice" (NW NW Sec. 8, T41NR6E), Lucy Lake, Mindys Lake (Sec. 8, T40NR5E), Minette Lake, Mitten Lake, Monk's Lake (Sec. 13, T40NR5E), Moving Cloud Lake, Mud Creek, Muskesin Lake, Patterson Lake, Placid Twin Lake (North), Placid Twin Lake (South), Plummer Lake, Poupart Lake, Prairie Lake (NE SW Sec. 13, T40NR4E), Raven Lake, Ross Allen Lake, Sand Lake, Little, Scott Lake (Sec. 22, T40N, R4E), Shishebogama Lake, Signal Lake, Snort Lake (Sec. 5, T41N, R6E), Spring Lake "Jerms", Squirrel Lake, Statenaker Lake "Hollow", Stearns Lake "Hourglass", Sugarbush "Hidden Lake" (NW NW Sec. 17, T41NR5E), Sugarbush Creek, Sugarbush Lake, Little, Sugarbush Lake, Lower, Sugarbush Lake, Middle, Sugarbush Lake, Upper, Sunfish Lake, Tippecanoe Lake, Tomahawk River, To-To Tom Lake, Toulsh Lake, Trout River, Warrior Lake, White Sand Lake, Whitefish Lake "Cattail Lake" (Sec. 34, T40N5R), Wishow Lake, Wyandock Lake. |
|               | Tier 3   | Outstanding Tribal Resource Waters: Bear River (1st bridge to Reservation boundary), Big Springs (Sec. 25, T40NR4E), Black Lake, Cranberry Lake, Doud Lake, Eagle Lake, Gene Lake, Johnson Springs, Little Trout Lake, Lost Lake (Sect. 1, T41NR4E), Mishonagon Creek, Munnomin (Jesse, Duck) Lake, Negani (Hegani) Lake, Reservation Line Lake, Spring Creek, Tank Lake, Thomas Lake, Wild Rice Lake, Zee Lake.   |



| Permit Number | Areas of Coverage/Where EPA Is Permitting Authority   |        |   |        |
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| NMR100000     | <b>State of New Mexico</b>  |        |   |        |
|               | Tier 2 waters are identified on a parameter-by-parameter basis. There is not a Tier 2.5 classification identified in the State of New Mexico Water Quality Standards. New dischargers and new sources should contact EPA Region 6's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-new-mexico">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-new-mexico</a>                    |        |   |        |
|               | <table> <tr> <td>Tier 2</td><td>If you need assistance determining if your discharge is to a Tier 2 waterbody, please contact the NMED Surface Water Quality Bureau's Stormwater Program at <a href="https://www.env.nm.gov/swqb/StormWater/index.html">https://www.env.nm.gov/swqb/StormWater/index.html</a>.</td></tr> <tr> <td>Tier 3</td><td>See <a href="https://www.env.nm.gov/swqb/ONRW/">https://www.env.nm.gov/swqb/ONRW/</a> for current list of NMED's Tier 3/Outstanding National Resource Waters. See also New Mexico's Water Quality Standards at 20.6.4.9.D NMAC.</td></tr> </table> | Tier 2 | If you need assistance determining if your discharge is to a Tier 2 waterbody, please contact the NMED Surface Water Quality Bureau's Stormwater Program at <a href="https://www.env.nm.gov/swqb/StormWater/index.html">https://www.env.nm.gov/swqb/StormWater/index.html</a> . | Tier 3 |
| Tier 2        | If you need assistance determining if your discharge is to a Tier 2 waterbody, please contact the NMED Surface Water Quality Bureau's Stormwater Program at <a href="https://www.env.nm.gov/swqb/StormWater/index.html">https://www.env.nm.gov/swqb/StormWater/index.html</a> .   |        |   |        |
| Tier 3        | See <a href="https://www.env.nm.gov/swqb/ONRW/">https://www.env.nm.gov/swqb/ONRW/</a> for current list of NMED's Tier 3/Outstanding National Resource Waters. See also New Mexico's Water Quality Standards at 20.6.4.9.D NMAC.   |        |   |        |
| NMR10I000     | <b>Ohkay Owingeh (NM) (formerly the Pueblo of San Juan)</b>   |        |   |        |
|               | New dischargers and new sources should contact EPA Region 6's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-ohkay-owingeh-pueblo-formerly-pueblo-san-juan">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-ohkay-owingeh-pueblo-formerly-pueblo-san-juan</a>   |        |   |        |
|               | <b>Pueblo of Acoma (NM)</b>   |        |   |        |
|               | New dischargers and new sources should contact EPA Region 6's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-acoma">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-acoma</a>   |        |   |        |
|               | <b>Pueblo of Isleta (NM)</b>  |        |   |        |
|               | New dischargers and new sources should contact EPA Region 6's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-isleta">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-isleta</a>   |        |   |        |
|               | <b>Pueblo of Nambe (NM)</b>   |        |   |        |
|               | New dischargers and new sources should contact EPA Region 6's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-nambe">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-nambe</a>   |        |   |        |
|               | <b>Pueblo of Picuris (NM)</b>   |        |   |        |
|               | New dischargers and new sources should contact EPA Region 6's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . Tier 2, 2.5, and 3 classifications are included in the Pueblo of Picuris Water Quality Standards. See: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-picuris">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-picuris</a>  |        |   |        |



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|               | <b>Pueblo of Pojoaque (NM)</b>  |
|               | New dischargers and new sources should contact EPA Region 6's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-pojoaque">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-pojoaque</a>       |
|               | <b>Pueblo of Sandia (NM)</b>  |
|               | New dischargers and new sources should contact EPA Region 6's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-sandia">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-sandia</a>           |
|               | <b>Pueblo of Santa Ana (NM)</b>   |
|               | New dischargers and new sources should contact EPA Region 6's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-santa-ana">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-santa-ana</a>     |
|               | <b>Pueblo of Santa Clara (NM)</b>   |
|               | New dischargers and new sources should contact EPA Region 6's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-santa-clara">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-santa-clara</a> |
|               | <b>Pueblo of Taos (NM)</b>  |
|               | New dischargers and new sources should contact EPA Region 6's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-taos">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-taos</a>               |
|               | Tier 3 Outstanding Tribal Resource Waters: Mountain Lakes; Mountain Streams & Springs;  |
|               | <b>Pueblo of Tesuque (NM)</b>   |
|               | New dischargers and new sources should contact EPA Region 6's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-tesuque">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pueblo-tesuque</a>         |
| COR10I000     | <b>Ute Mountain Ute Tribe</b>   |
|               | Tier 2 waters are identified on a parameter-by-parameter basis. There is not a Tier 2.5 classification identified in the Ute Mountain Ute Tribe Water Quality Standards. New dischargers and new sources should contact EPA Region 8's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also:              |

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|               | <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-ute-mountain-ute-tribe">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-ute-mountain-ute-tribe</a>   |  |
|               | Tier 3  | Outstanding Tribal Resource Waters: 1. Ute Spring and unnamed creek from Ute Spring downstream within Section 12, TWP35N R18W (Colorado). 2. Allen Canyon Creek, Sections 17, 20, 29, 30, 31, TWP 35S, R21E (Utah) 3. "Lopez" Spring and unnamed creek tributary to and downstream from the spring, within Section 35, TWP 34N, R18W                 |
| MTR10I000     | <b>Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation (MT)</b>  |  |
|               | Tier 2 waters are identified on a water body-by-water body basis. There is not a Tier 2.5 classification identified in the Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation Water Quality Standards. New dischargers and new sources should contact EPA Region 8's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-assiniboine-and-sioux-tribes-fort-peck-indian">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-assiniboine-and-sioux-tribes-fort-peck-indian</a>          |  |
|               | Tier 2  | Most Tribal Waters will qualify as Tier 2 waters. Unless the water body is not attaining the Clean Water Act Section 101(a)(2) goals, the water body has received an OTRW designation, or there is no assimilative capacity for pollutants to protect existing and designated uses, it is likely that the water body will receive Tier 2 protection. |
|               | <b>Confederated Salish and Kootenai Tribes of the Flathead Reservation (MT)</b>   |  |
|               | Tier 2 waters are identified on a water body-by-water body basis. There is not a Tier 2.5 classification identified in the Confederated Salish and Kootenai Tribes of the Flathead Reservation Water Quality Standards. New dischargers and new sources should contact EPA Region 8's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-confederated-salish-and-kootenai-tribes-flathead">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-confederated-salish-and-kootenai-tribes-flathead</a> |  |
|               | Tier 3  | The following are Tier 3 waters: All waters located within Tribally designated primitive or wilderness areas.  |
| ASR100000     | <b>Northern Cheyenne (MT)</b>   |  |
|               | Tier 2 waters are identified on a water body-by-water body basis. There is not a Tier 2.5 classification identified in the Northern Cheyenne Water Quality Standards. New dischargers and new sources should contact EPA Region 8's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-northern-cheyenne-tribe-northern-cheyenne-reservation">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-northern-cheyenne-tribe-northern-cheyenne-reservation</a>   |  |
| ASR100000     | <b>Island of American Samoa</b>   |  |
|               | New dischargers and new sources should contact EPA Region 9's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/sites/production/files/2014-12/documents/aswqs.pdf">https://www.epa.gov/sites/production/files/2014-12/documents/aswqs.pdf</a>   |  |

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|---------------|---|--|
| AZR10I000     | <b>Hopi Tribe (AZ)</b>  |  |
|               | Tier 2 waters are identified on a parameter-by-parameter basis. There is not a Tier 2.5 classification identified in the Hopi Tribe Water Quality Standards. New dischargers and new sources should contact EPA Region 9's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-hopi-tribe">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-hopi-tribe</a>  |  |
|               | Tier 3  | Unique Waters: In the Moencopi Wash watershed, from Blue Canyon Springs to the confluence of Begashibito Wash.   |
|               | <b>Hualapai Indian Tribe (AZ)</b>   |  |
|               | Tier 2 waters are identified on a parameter-by-parameter basis. There is not a Tier 2.5 classification identified in the Hualapai Indian Tribe Water Quality Standards. New dischargers and new sources should contact EPA Region 9's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-hualapai-tribe">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-hualapai-tribe</a>                                   |  |
|               | Tier 3  | Segments assigned as Tier 3: Spencer; Meriwhitica; Willow Spring; Upper Milkweed Spring; Bridge Canyon; Travertine Spring; Travertine Falls; Diamond Creek; Diamond Creek Spring; Blue Mountain; Metuck; Peach Springs Spring; Westwater; Clay Tank; Hockey Puck; Pocamote Spring; Mohawk Spring; Granite Spring; Three Spring; Warm Spring; Honga Spring; National Canyon Spring; National Canyon; Moss Spring. |
|               | <b>Navajo Nation (AZ, NM, UT)</b>   |  |
|               | New dischargers and new sources should contact EPA Region 9's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-navajo-nation">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-navajo-nation</a>   |  |
|               | <b>White Mountain Apache Tribe (AZ)</b>   |  |
|               | Tier 2 waters are identified on a water body-by-water body basis. Tier classifications are identified in Appendix B of the White Mountain Apache Tribe Water Quality Standards. New dischargers and new sources should contact EPA Region 9's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-white-mountain-apache-tribe">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-white-mountain-apache-tribe</a> |  |

| Permit Number | Areas of Coverage/Where EPA Is Permitting Authority   |  |
|---------------|---|--|
|               | Tier 2  | <p>High Quality Waters: East Fork White River, above R52 Road; Paradise Creek, above Wohlenberg; Ord Creek; Smith Cienega; Bull Cienega; Smith Creek; Big Bonito; Tonto Creek, below Y47 Crossing; Crooked Creek; Boggy Creek; Little Bonito Creek, above Y55 Crossing; Flash Creek; Squaw Creek; Hurricane Lake; Hurricane Creek; Hughey Creek; Bonito Cienega; West Fork Black River; Hall Cienega; Purcell Cienega; Thompson Creek; Cibecue Creek in Box Canyon to Salt river; Rock Springs Creek; Willow Creek (Lower Canyon Cr.).</p> <p>Sensitive Waters (treated the same manner as Tier 2): East Fork White River below R52 Road, above Rock Cr; Lofer Cienega Creek; Carrizo Creek above Corduroy; Cedar Creek; Big Canyon (E. Cedar Creek); Middle Cedar Creek; West Cedar Creek; Cibecue Creek, Box Canyon up to Confluence with Salt Creek; Spring Creek; Salt Creek; Cibecue Creek, from confluence w/Salt Cr. To Big Springs; Cibecue Creek, above Big Springs; Salt Draw; Canyon Creek S. of Chediski Farms; Oak Creek; Canyon Creek, N. of Chediski Farms.</p> |
|               | Tier 3  | Outstanding Waters: East Fork White River, in Wilderness area; Pumpkin Lake.   |
| CAR10I000     | <b>Big Pine Band of Owens Valley (CA)</b>   |  |
|               | <p>New dischargers and new sources should contact EPA Region 9's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a>. See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-big-pine-paiute-tribe-owens-valley">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-big-pine-paiute-tribe-owens-valley</a></p>         |  |
|               | <b>Hoop Valley Tribe (CA)</b>   |  |
|               | <p>New dischargers and new sources should contact EPA Region 9's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a>. See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-hoop-valley-tribe">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-hoop-valley-tribe</a></p>   |  |
|               | <b>Paiute-Shoshone Indians of the Bishop Community (CA)</b>   |  |
|               | <p>New dischargers and new sources should contact EPA Region 9's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a>. See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-bishop-paiute-tribe">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-bishop-paiute-tribe</a></p>                                       |  |
|               | <b>Twenty-Nine Palms (CA)</b>   |  |
|               | <p>New dischargers and new sources should contact EPA Region 9's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a>. See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-twenty-nine-palms-band-mission-indians">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-twenty-nine-palms-band-mission-indians</a></p> |  |

| Permit Number | Areas of Coverage/Where EPA Is Permitting Authority  |   |
|---------------|--|---|
| GUR100000     | <b>Island of Guam</b>  |   |
|               | New dischargers and new sources should contact EPA Region 9's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/sites/production/files/2014-12/documents/aswqs.pdf">https://www.epa.gov/sites/production/files/2014-12/documents/aswqs.pdf</a>  |   |
| JAR100000     | <b>Johnston Atoll</b>  |   |
|               | New dischargers and new sources should contact EPA Region 9's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a>  |   |
| MPR100000     | <b>Commonwealth of the Northern Mariana Islands</b>  |   |
|               | New dischargers and new sources should contact EPA Region 9's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/sites/production/files/2014-12/documents/aswqs.pdf">https://www.epa.gov/sites/production/files/2014-12/documents/aswqs.pdf</a>  |   |
| MWR100000     | <b>Midway Island and Wake Island</b>   |   |
|               | New dischargers and new sources should contact EPA Region 9's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a>  |   |
| NVR100001     | <b>Pyramid Lake Paiute (NV)</b>  |   |
|               | New dischargers and new sources should contact EPA Region 9's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pyramid-lake-paiute-tribe">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-pyramid-lake-paiute-tribe</a>  |   |
| IDR100000     | <b>State of Idaho</b>  |   |
|               | Tier 2 waters are identified on a water body-by-water body basis. There is not a Tier 2.5 classification identified in the State of Idaho Water Quality Standards. New dischargers and new sources should contact EPA Region 10's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-idaho">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-idaho</a>  |   |
|               | Tier 2 and Tier 3  | For Tier 2 and Tier 3 waters, please consult the most recent approved version of Idaho's Idaho Integrated Report, available at: <a href="http://www.deq.idaho.gov/water-quality/surface-water/monitoring-assessment/integrated-report/">http://www.deq.idaho.gov/water-quality/surface-water/monitoring-assessment/integrated-report/</a> and the closest regional office of the Idaho Department of Environmental Quality: <a href="http://www.deq.idaho.gov/regional-offices-issues/">http://www.deq.idaho.gov/regional-offices-issues/</a> . |
| IDR10I000     | <b>Coeur D'Alene Tribe (ID)</b>  |   |
|               | Tier 2 waters are identified on a water body-by-water body basis. There is not a Tier 2.5 classification identified in the Coeur D'Alene Tribe Water Quality Standards. New dischargers and new sources should contact EPA Region 10's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-coeur-dalene-tribe-indians">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-coeur-dalene-tribe-indians</a> |   |

| Permit Number | Areas of Coverage/Where EPA Is Permitting Authority  |
|---------------|--|
| ORR10I000     | <b>Confederated Tribes of the Warm Springs Reservation (OR)</b>  |
|               | New dischargers and new sources should contact EPA Region 10's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-confederated-tribes-warm-springs-indian-reservation">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-confederated-tribes-warm-springs-indian-reservation</a>   |
|               | <b>Confederated Tribes of Umatilla (OR)</b>  |
|               | New dischargers and new sources should contact EPA Region 10's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-confederated-tribes-umatilla-indian-reservation-oregon">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-confederated-tribes-umatilla-indian-reservation-oregon</a>   |
| WAR10I000     | <b>Confederated Tribes of the Chehalis Reservation (WA)</b>  |
|               | Tier 2 waters are identified on a parameter-by-parameter basis. There is not a Tier 2.5 classification identified in the Confederated Tribes of the Chehalis Reservation Water Quality Standards. New dischargers and new sources should contact EPA Region 10's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-confederated-tribes-chehalis-reservation">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-confederated-tribes-chehalis-reservation</a> |
|               | <b>Confederated Tribes of the Colville Reservation (WA)</b>  |
|               | EPA established federal water quality standards for the Confederated Tribes of the Colville Reservation at 40 CFR 131.35. See: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-confederated-tribes-colville-reservation">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-confederated-tribes-colville-reservation</a>   |
|               | <b>Kalispel Indian Community (WA)</b>  |
|               | New dischargers and new sources should contact EPA Region 10's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-kalispel-indian-community-kalispel-reservation">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-kalispel-indian-community-kalispel-reservation</a>   |
|               | <b>Lummi Tribe (WA)</b>  |
|               | New dischargers and new sources should contact EPA Region 10's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-lummi-nation">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-lummi-nation</a>   |
|               | <b>Makah Indian Nation (WA)</b>  |
|               | New dischargers and new sources should contact EPA Region 10's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also: <a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-makah-indian-nation">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-makah-indian-nation</a>   |

| Permit Number | Areas of Coverage/Where EPA Is Permitting Authority   |
|---------------|---|
|               | <b>Port Gamble S'Klallam (WA)</b>   |
|               | New dischargers and new sources should contact EPA Region 10's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also:<br><a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-port-gamble-sklallam-tribe">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-port-gamble-sklallam-tribe</a> |
|               | <b>Puyallup Tribe of Indians (WA)</b>   |
|               | New dischargers and new sources should contact EPA Region 10's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also:<br><a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-puyallup-tribe-indians">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-puyallup-tribe-indians</a>         |
|               | <b>Spokane Tribe of Indians (WA)</b>  |
|               | New dischargers and new sources should contact EPA Region 10's stormwater coordinator found at <a href="https://www.epa.gov/npdes/contact-us-stormwater#regional">https://www.epa.gov/npdes/contact-us-stormwater#regional</a> . See also:<br><a href="https://www.epa.gov/wqs-tech/water-quality-standards-regulations-spokane-tribe-indians">https://www.epa.gov/wqs-tech/water-quality-standards-regulations-spokane-tribe-indians</a>           |

**Appendix G – Buffer Requirements**

The purpose of this appendix is to assist you in complying with the requirements in Part 2.2.1 of the permit regarding the establishment of natural buffers and/or equivalent sediment controls. This appendix is organized as follows:

G.1 Sites That Are Required to Provide and Maintain Natural Buffers and/or Equivalent Erosion and Sediment controls .....2

G.2 Compliance Alternatives and Exceptions .....2

    G.2.1 Compliance Alternatives .....2

    G.2.2 Exceptions to the Compliance Alternatives .....3

    G.2.3 Requirements for Providing and Maintaining Natural Buffers .....4

    G.2.4 Guidance for Providing the Equivalent Sediment Reduction as a 50-foot Buffer .....7

G.3 Small Residential Lot Compliance Alternatives ..... 11

    G.3.1 Small Residential Lot Compliance Alternative Eligibility ..... 11

    G.3.2 Small Residential Lot Compliance Alternatives ..... 11



## G.1 SITES THAT ARE REQUIRED TO PROVIDE AND MAINTAIN NATURAL BUFFERS AND/OR EQUIVALENT EROSION AND SEDIMENT CONTROLS

The requirement in Part 2.2.1 to provide and maintain natural buffers and/or equivalent erosion and sediment controls applies for any discharges to waters of the U.S. located within 50 feet of your site's earth disturbances. If the water of the U.S. is not located within 50 feet of earth-disturbing activities, Part 2.2.1 does not apply. See Figure G-1.

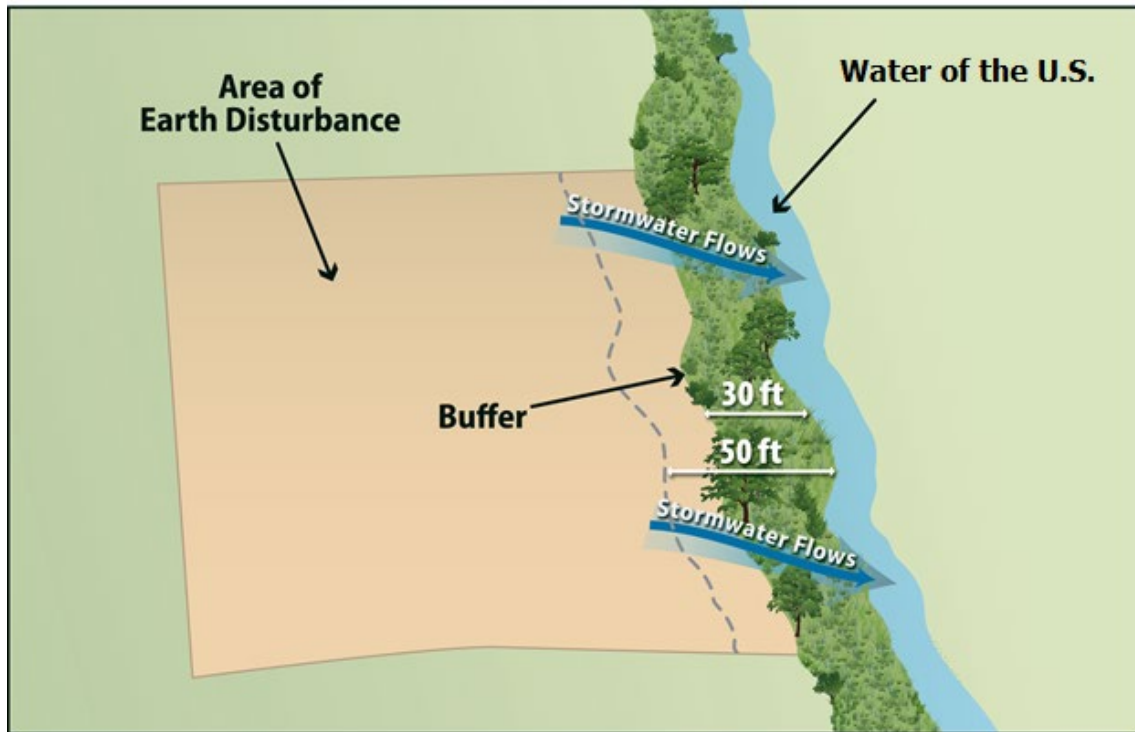


Figure G-1 Example of earth-disturbing activities within 50 feet of a water of the U.S.

## G.2 COMPLIANCE ALTERNATIVES AND EXCEPTIONS

### G.2.1 Compliance Alternatives

If Part 2.2.1 applies to your site, you have three compliance alternatives from which you can choose, unless you qualify for any of the exceptions (see below and Part 2.2.1.a):

1. Provide and maintain a 50-foot undisturbed natural buffer; or
2. Provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by erosion and sediment controls that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer; or
3. If infeasible to provide and maintain an undisturbed natural buffer of any size, implement erosion and sediment controls to achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.<sup>1</sup>

The compliance alternative selected must be maintained throughout the duration of permit coverage.

See Part G.2.2 below for exceptions to the compliance alternatives.

See Part G.2.3 for requirements applicable to providing and maintaining natural buffers under compliance alternatives 1 and 2 above.

See Part G.2.4 for requirements applicable to providing erosion and sediment controls that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer under compliance alternatives 2 and 3 above.

## **G.2.2 Exceptions to the Compliance Alternatives**

The following exceptions apply to the requirement to implement one of the Part 2.2.1.a compliance alternatives (see also Part 2.2.1.b):

- The following disturbances within 50 feet of a water of the U.S. are exempt from the requirements Part 2.2.1 and this Appendix:
  - Construction approved under a CWA Section 404 permit; or
  - Construction of a water-dependent structure or water access areas (e.g., pier, boat ramp, trail).
- If there is no discharge of stormwater to waters of the U.S. through the area between the disturbed portions of the site and any waters of the U.S. located within 50 feet of your site, you are not required to comply with the requirements in Part 2.2.1 and this Appendix. This includes situations where you have implemented controls measures, such as a berm or other barrier, that will prevent such discharges.
- Where no natural buffer exists due to preexisting development disturbances (e.g., structures, impervious surfaces) that occurred prior to the initiation of planning for the current development of the site, you are not required to comply with the requirements in Part 2.2.1 and this Appendix.

Where some natural buffer exists but portions of the area within 50 feet of the water of the U.S. are occupied by preexisting development disturbances, you are required to comply with the requirements in Part 2.2.1 and this Appendix. For the purposes of calculating the sediment load reduction for either compliance alternative 2 or 3, you are not expected to compensate for the reduction in buffer function that would have resulted from the area covered by these preexisting disturbances. Clarity about how to implement the compliance alternatives for these situations is provided in G.2.3 and G.2.4 below.

If during your project, you will disturb any portion of these preexisting disturbances, the area removed will be deducted from the area treated as a "natural buffer."

- For "linear construction sites" (see Appendix A), you are not required to comply with this requirement if site constraints (e.g., *limited right-of-way*) make it infeasible to implement one of the Part 2.2.1.a compliance alternatives, provided that, to the extent feasible, you limit disturbances within 50 feet of any waters of the U.S. and/or you provide supplemental erosion and sediment controls to treat stormwater discharges from earth disturbances within 50 feet of the water of the U.S. You must also document in your SWPPP your rationale for why it is infeasible for you to implement one of the Part 2.2.1.a compliance alternatives, and describe any buffer width retained and supplemental erosion and sediment controls installed.
- For "small residential lot" construction (*i.e., a lot being developed for residential purposes that will disturb less than 1 acre of land, but is part of a larger residential*

*project that will ultimately disturb greater than or equal to 1 acre), you have the option of complying with one of the "small residential lot" compliance alternatives in Part G.3 of this appendix.*

Note that you must document in your SWPPP if any disturbances related to any of the above exceptions occurs within the buffer area on your site.

### **G.2.3 Requirements for Providing and Maintaining Natural Buffers**

This part of the appendix applies to you if you choose compliance alternative 1 (50-foot buffer), compliance alternative 2 (a buffer of < 50 feet supplemented by additional erosion and sediment controls that achieve the equivalent sediment load reduction as the 50-foot buffer), or if you are providing a buffer in compliance with one of the "small residential lot" compliance alternatives in Part G.3.

#### **Buffer Width Measurement**

Where you are retaining a buffer of any size, the buffer should be measured perpendicularly from any of the following points, whichever is further landward from the water:

1. The ordinary high water mark of the water body, defined as the line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, and/or the presence of litter and debris; or
2. The edge of the stream or river bank, bluff, or cliff, whichever is applicable.

Refer to Figure G-2 and Figure G-3. You may find that specifically measuring these points is challenging if the flow path of the water of the U.S. changes frequently, thereby causing the measurement line for the buffer to fluctuate continuously along the path of the waterbody. Where this is the case, EPA suggests that rather than measuring each change or deviation along the water's edge, it may be easier to select regular intervals from which to conduct your measurement. For instance, you may elect to conduct your buffer measurement every 5 to 10 feet along the length of the water.

Additionally, note that if earth-disturbing activities will take place on both sides of a water of the U.S. that flows through your site, to the extent that you are establishing a buffer around this water, it must be established on both sides. For example, if you choose compliance alternative 1, and your project calls for disturbances on both sides of a small stream, you would need to retain the full 50 feet of buffer on both sides of the water. However, if your construction activities will only occur on one side of the stream, you would only need to retain the 50-foot buffer on the side of the stream where the earth-disturbance will occur.

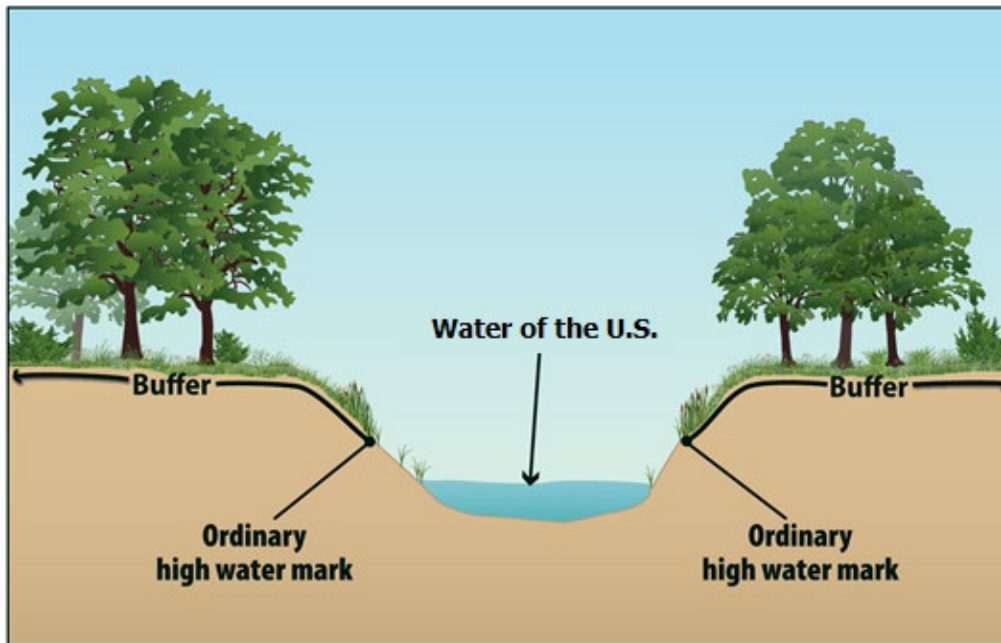


Figure G-2 Buffer measurement from the ordinary high water mark of the water body, as indicated by a clear natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, and/or the presence of litter/debris.

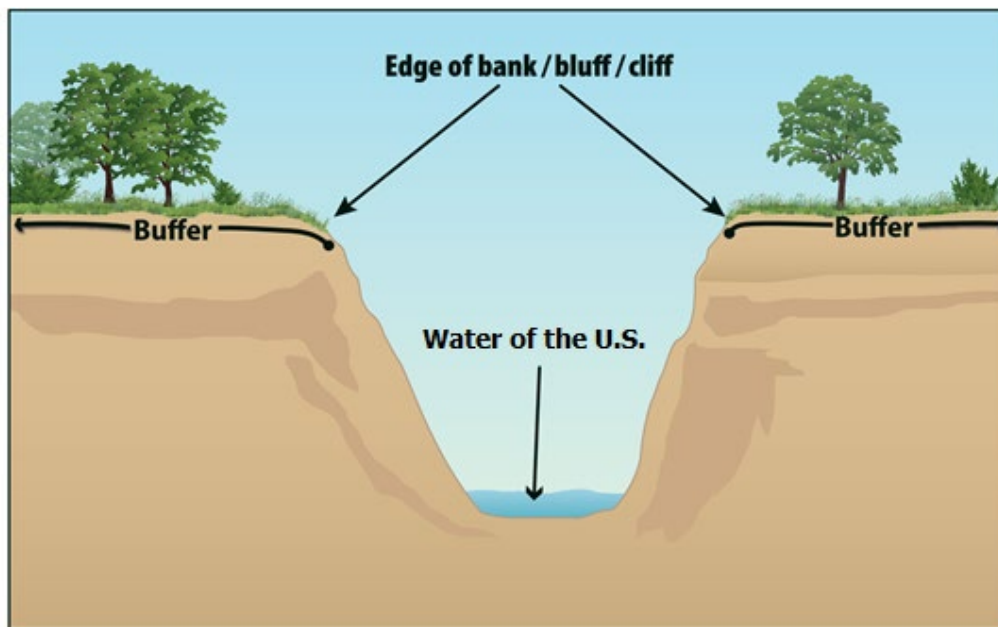


Figure G-3 Buffer measurement from the edge of the bank, bluff, or cliff, whichever is applicable.

#### Limits to Disturbance Within the Buffer

You are considered to be in compliance with the requirement to provide and maintain a natural buffer if you retain and protect from construction activities the natural buffer that existed prior to the commencement of construction. If the buffer area contains no vegetation prior to the commencement of construction (e.g., sand or rocky surface), you are not required to plant vegetation. As noted above, any preexisting structures or

impervious surfaces may occur in the natural buffer provided you retain and protect from disturbance the buffer areas outside of the preexisting disturbance.

To ensure that the water quality protection benefits of the buffer are retained during construction, you are prohibited from conducting any earth-disturbing activities within the buffer during permit coverage. In furtherance of this requirement, **prior to commencing earth-disturbing activities on your site, you must delineate, and clearly mark off, with flags, tape, or a similar marking device, the buffer area on your site.** The purpose of this requirement is to make the buffer area clearly visible to the people working on your site so that unintended disturbances are avoided.

While you are not required to enhance the quality of the vegetation that already exists within the buffer, you are encouraged to do so where such improvements will enhance the water quality protection benefits of the buffer. (Note that any disturbances within the buffer related to buffer enhancement are permitted and do not constitute construction disturbances.) For instance, you may want to target plantings where limited vegetation exists, or replace existing vegetation where invasive or noxious plant species (see <http://plants.usda.gov/java/noxiousDriver>) have taken over. In the case of invasive or noxious species, you may want to remove and replace them with a diversity of native trees, shrubs, and herbaceous plants that are well-adapted to the climatic, soil, and hydrologic conditions on the site. You are also encouraged to limit the removal of naturally deposited leaf litter, woody debris, and other biomass, as this material contributes to the ability of the buffer to retain water and filter pollutants.

If a portion of the buffer area adjacent to the water of the U.S. is owned by another party and is not under your control, you are only required to retain and protect from construction activities the portion of the buffer area that is under your control. For example, if you comply with compliance alternative 1 (provide and maintain a 50-foot buffer), but 10 feet of land immediately adjacent to the water of the U.S. is owned by a different party than the land on which your construction activities are taking place and you do not have control over that land, you must only retain and protect from construction activities the 40-foot buffer area that occurs adjacent to the property on which your construction activities are taking place. EPA would consider you to be in compliance with this requirement regardless of the activities that are taking place in the 10-foot area that is owned by a different party than the land on which your construction activities are taking place that you have no control over.

### **Discharges to the Buffer**

**You must ensure that all discharges from the area of earth disturbance to the natural buffer are first treated by the site's erosion and sediment controls** (for example, you must comply with the Part 2.2.3 requirement to install sediment controls along any perimeter areas of the site that will receive pollutant discharges), **and if necessary to prevent erosion caused by stormwater flows within the buffer, you must use velocity dissipation devices.** The purpose of this requirement is to decrease the rate of stormwater flow and encourage infiltration so that the pollutant filtering functions of the buffer will be achieved. To comply with this requirement, construction operators typically will use devices that physically dissipate stormwater flows so that the discharge entering the buffer is spread out and slowed down.

### **SWPPP Documentation**

You are required to document in your SWPPP the natural buffer width that is retained. For example, if you are complying with alternative 1, you must specify in your SWPPP that you are providing a 50-foot buffer. Or, if you will be complying with alternative 2, you must document the reduced width of the buffer you will be retaining (and you must also

describe the erosion and sediment controls you will use to achieve an equivalent sediment reduction, as required in Part G.2.4 below). Note that you must also show any buffers on your site map in your SWPPP consistent with Part 7.2.4.i. Additionally, if any disturbances related to the exceptions in Part G.2.2 occur within the buffer area, you must document this in the SWPPP.

#### **G.2.4 Guidance for Providing the Equivalent Sediment Reduction as a 50-foot Buffer**

This part of the appendix applies to you if you choose compliance alternative 2 (provide and maintain a buffer that is less than 50 feet that is supplemented by erosion and sediment controls that achieve the sediment load reduction equivalent to a 50-foot buffer) or compliance alternative 3 (implement erosion and sediment controls to achieve the sediment load reduction equivalent to a 50-foot buffer).

##### **Determine Whether it is Feasible to Provide a Reduced Buffer**

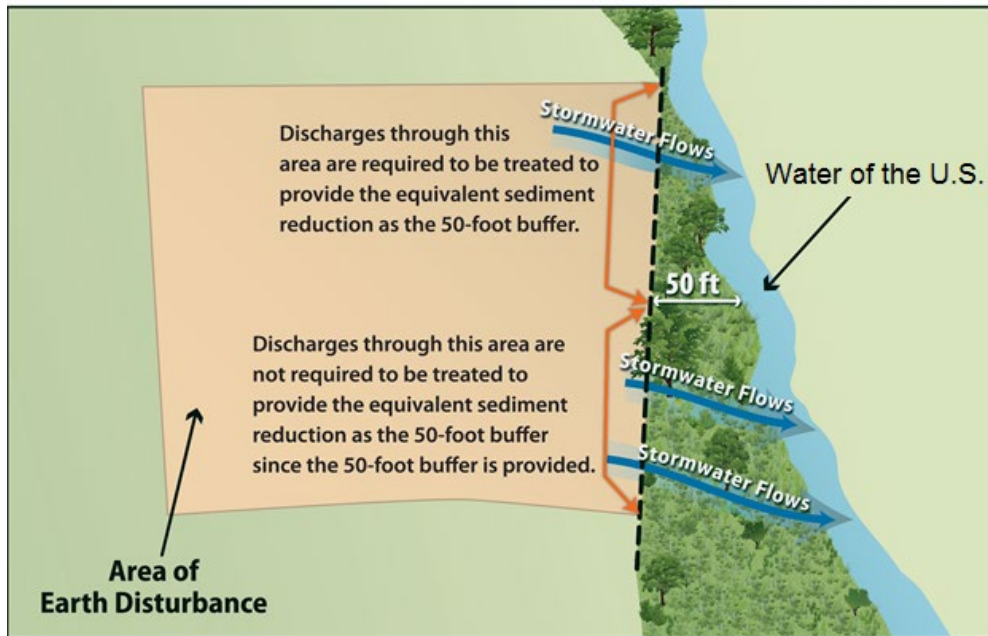
EPA recognizes that there will be a number of situations in which it will be infeasible to provide and maintain a buffer of any width. While some of these situations may exempt you from the buffer requirement entirely (see G.2.2), if you do not qualify for one of these exemptions, there still may be conditions or circumstances at your site that make it infeasible to provide a natural buffer. For example, there may be sites where a significant portion of the property on which the earth-disturbing activities will occur is located within the buffer area, thereby precluding the retention of natural buffer areas.

Therefore, you should choose compliance alternative 2 if it is feasible for you to retain some natural buffer on your site. (Note: For any buffer width retained, you are required to comply with the requirements in Part G.2.3, above, concerning the retention of vegetation and restricting earth disturbances.) Similarly, if you determine that it is infeasible to provide a natural buffer of any size during construction, you should choose alternative 3.

##### **Design Controls That Provide Equivalent Sediment Reduction as 50-foot Buffer**

You must next determine what additional controls must be implemented on your site that, alone or in combination with any retained natural buffer, achieve a reduction in sediment equivalent to that achieved by a 50-foot buffer.

Note that if only a portion of the natural buffer is less than 50 feet, you are only required to implement erosion and sediment controls that achieve the sediment load reduction equivalent to the 50-foot buffer for discharges through that area. You would not be required to provide additional treatment of stormwater discharges that flow through 50 feet or more of natural buffer. See Figure G-4.



**Figure G-4 Example of how to comply with the requirement to provide the equivalent sediment reduction when only a portion of your earth-disturbances discharge to a buffer of less than 50-feet.**

Steps to help you meet compliance alternative 2 and 3 requirements are provided below.

#### **Step 1 - Estimate the Sediment Reduction from the 50-foot Buffer**

In order to design controls that match the sediment removal efficiency of a 50-foot buffer, you first need to know what this efficiency is for your site. The sediment removal efficiencies of natural buffers vary according to a number of site-specific factors, including precipitation, soil type, land cover, slope length, width, steepness, and the types of erosion and sediment controls used to reduce the discharge of sediment prior to the buffer. EPA has simplified this calculation by developing buffer performance tables covering a range of vegetation and soil types for the areas covered by the CGP. See Attachment 1 of this Appendix, Tables G-8 through G-15. Note: buffer performance values in Tables G-8 through G-15 represent the percent of sediment captured through the use of perimeter controls (e.g., silt fences) and 50-foot buffers at disturbed sites of fixed proportions and slopes.<sup>1</sup>

<sup>1</sup> EPA used the following when developing the buffer performance tables:

- The sediment removal efficiencies are based on the U.S. Department of Agriculture's RUSLE2 ("Revised Universal Soil Loss Equation 2") model for slope profiles using a 100-foot long denuded slopes.
- Sediment removal was defined as the annual sediment delivered at the downstream end of the 50-foot natural buffer (tons/yr/acre) divided by the annual yield from denuded area (tons/yr/acre).
- As perimeter controls are also required by the CGP, sediment removal is in part a function of the reduction due to a perimeter control (i.e., silt fence) located between the disturbed portion of the site and the upstream edge of the natural buffer and flow traveling through a 50-foot buffer of undisturbed natural vegetation.
- It was assumed that construction sites have a relatively uniform slope without topographic features that accelerate the concentration for erosive flows.



Using Tables G-8 through G-15 (see Attachment 1 of this Appendix), you can determine the sediment removal efficiency of a 50-foot buffer for your geographic area by matching the vegetative cover type that best describes your buffer area and the type of soils that predominate at your site. For example, if your site is located in Massachusetts (Table G-9), and your buffer vegetation corresponds most closely with that of tall fescue grass, and the soil type at your site is best typified as sand, your site's sediment removal efficiency would be 81 percent.

In this step, you should choose the vegetation type in the tables that most closely matches the vegetation that would exist naturally in the buffer area on your site regardless of the condition of the buffer. However, because you are not required to plant any additional vegetation in the buffer area, in determining what controls are necessary to meet this sediment removal equivalency in Step 2 below, you will be able to take credit for this area as a fully vegetated "natural buffer."

Similarly, if a portion of the buffer area adjacent to the water of the U.S. is owned by another party and is not under your control, you can treat the area of land not under your control as having the equivalent vegetative cover and soil type that predominates on the portion of the property on which your construction activities are occurring.

*For example, if your earth-disturbances occur within 50 feet of a water of the U.S., but the 10 feet of land immediately adjacent to the water of the U.S. is owned by a different party than the land on which your construction activities are taking place and you do not have control over that land, you can treat the 10 foot area adjacent to the stream as having the equivalent soil and vegetation type that predominates in the 40 foot area under your control. You would then make the same assumption in Step 2 for purposes of determining the equivalent sediment removal.*

Alternatively, you may do your own calculation of the effectiveness of the 50-foot buffer based upon your site-specific conditions, and may use this number as your sediment removal equivalency standard to meet instead of using Tables G-8 through G-15. This calculation must be documented in your SWPPP.

### **Step 2 - Design Controls That Match the Sediment Removal Efficiency of the 50-foot Buffer**

Once you determine the estimated sediment removal efficiency of a 50-foot buffer for your site in Step 1, you must next select stormwater controls that will provide an equivalent sediment load reduction. These controls can include the installation of a single control, such as a sediment pond or additional perimeter controls, or a combination of stormwater controls. Whichever control(s) you select, you must demonstrate in your SWPPP that the controls will provide at a minimum the same sediment removal capabilities as a 50-foot natural buffer (Step 1). You may take credit for the removal efficiencies of your required perimeter controls in your calculation of equivalency, because these were included in calculating the buffer removal efficiencies in Tables G-8 through G-15. (Note: You are reminded that the controls must be kept in effective operating condition until you complete final stabilization on the disturbed portions of the site discharging to the water of the U.S.)

- 
- It was assumed that vegetation has been removed from the disturbed portion of the site and a combination of cuts and fills have resulted in a smooth soil surface with limited retention of near-surface root mass.

To represent the influence of soil, EPA analyzed 11 general soil texture classifications in its evaluation of buffer performance. To represent different types of buffer vegetation, EPA evaluated 4 or more common vegetative types for each state/territory covered under the permit. For each vegetation type evaluated, EPA considered only permanent, non-grazed, and non-harvested vegetation, on the assumption that a natural buffer adjacent to the water of the U.S. will typically be undisturbed. EPA also evaluated slope steepness and found that sediment removal efficiencies present in Tables G-8 through G-15 are achievable for slopes that are less than nine percent.



To make the determination that your controls and/or buffer area achieve an equivalent sediment load reduction as a 50-foot buffer, you should use a model or other type of calculation. As mentioned above, there are a variety of models available that can be used to support your calculation, including USDA's RUSLE-series programs and the WEPP erosion model, SEDCAD, SEDIMOT, or other models. A couple of examples are provided in Attachment 3 to help illustrate how this determination could be made.

If you retain a buffer of less than 50 feet, you may take credit for the removal that will occur from the reduced buffer and only need to provide additional controls to make up the difference between the removal efficiency of a 50 foot buffer and the removal efficiency of the narrower buffer. For example, if you retain a 30 foot buffer, you can account for the sediment removal provided by the 30 foot buffer retained, and you will only need to design controls to make up for the additional removal provided by the 20 feet of buffer that is not being provided. To do this, you would plug the width of the buffer that is retained into RUSLE or another model, along with other stormwater controls that will together achieve a sediment reduction equivalent to a natural 50-foot buffer.

As described in Step 1 above, you can take credit for the area you retained as a "natural buffer" as being fully vegetated, regardless of the condition of the buffer area.

*For example, if your earth-disturbances occur 30 feet from a water of the U.S., but the 10 feet of land immediately adjacent to the water of the U.S. is owned by a different party than the land on which your construction activities are taking place and you do not have control over that land, you can treat the 10-foot area as a natural buffer, regardless of the activities that are taking place in the area. Therefore, you can assume (for purposes of your equivalency calculation) that your site is providing the sediment removal equivalent of a 30-foot buffer, and you will only need to design controls to make up for the additional removal provided by the 20-foot of buffer that is not being provided.*

### **Step 3 - Document How Site-Specific Controls Will Achieve the Sediment Removal Efficiency of the 50-foot Buffer**

In Steps 1 and 2, you determined both the expected sediment removal efficiency of a 50-foot buffer at your site, and you used this number as a performance standard to design controls to be installed at your site, which alone or in combination with any retained natural buffer, achieves the expected sediment removal efficiency of a 50-foot buffer at your site. The final step is to document in your SWPPP the information you relied on to calculate the equivalent sediment reduction as an undisturbed natural buffer.

EPA will consider your documentation to be sufficient if it generally meets the following:

- For Step 1, refer to the table in Attachment 1 that you used to derive your estimated 50-foot buffer sediment removal efficiency performance. Include information about the buffer vegetation and soil type that predominate at your site, which you used to select the sediment load reduction value in Tables G-8 through G-15. Or, if you conducted a site-specific calculation for sediment removal efficiency, provide the specific removal efficiency, and the information you relied on to make your site-specific calculation.
- For Step 2, (1) Specify the model you used to estimate sediment load reductions from your site; and (2) the results of calculations showing how your controls will meet or exceed the sediment removal efficiency from Step 1.

If you choose compliance alternative 3, you must also include in your SWPPP a description of why it is infeasible for you to provide and maintain an undisturbed natural buffer of any size.

### G.3 SMALL RESIDENTIAL LOT COMPLIANCE ALTERNATIVES

EPA has developed two additional compliance alternatives applicable only to “small residential lots” that are unable to provide and maintain a 50 foot buffer.

A **small residential lot** is a lot or grouping of lots being developed for residential purposes that will disturb less than 1 acre of land, but that is part of a larger residential project that will ultimately disturb greater than or equal to 1 acre.

The following steps describe how a small residential lot operator would achieve compliance with one these 2 alternatives.

#### G.3.1 Small Residential Lot Compliance Alternative Eligibility

In order to be eligible for the small residential lot compliance alternatives, the following conditions must be met:

- a. The lot or grouping of lots meets the definition of “small residential lot”; and
- b. The operator must follow the guidance for providing and maintaining a natural buffer in Part G.2.3 of this Appendix, including:
  - i. Ensure that all discharges from the area of earth disturbance to the natural buffer are first treated by the site’s erosion and sediment controls, and use velocity dissipation devices if necessary to prevent erosion caused by stormwater within the buffer;
  - ii. Document in the SWPPP the natural buffer width retained on the property, and show the buffer boundary on your site plan; and
  - iii. Delineate, and clearly mark off, with flags, tape, or other similar marking device, all natural buffer areas.

#### G.3.2 Small Residential Lot Compliance Alternatives

You must next choose from one of two small residential lot compliance alternatives and implement the stormwater control practices associated with that alternative.

*Note: The compliance alternatives provided below are not mandatory. Operators of small residential lots can alternatively choose to comply with the any of the options that are available to other sites in Part 2.2.1.a and G.2.1 of this Appendix.*

##### Small Residential Lot Compliance Alternative 1

Alternative 1 is a straightforward tiered-technology approach that specifies the controls that a small residential lot must implement based on the buffer width retained. To meet the requirements of small residential lot compliance alternative 1, you must implement the controls specified in Table G-1 based on the buffer width to be retained. See footnote 3, below, for a description of the controls you must implement.

*For example, if you are an operator of a small residential lot that will be retaining a 35-foot buffer and you choose Small Residential Lot Compliance Alternative 1, you must implement double perimeter controls between earth disturbances and the water of the U.S.*

In addition to implementing the applicable control, you must also document in your SWPPP how you will comply with small residential lot compliance alternative 1.

**Table G-1 Alternative 1 Requirements<sup>2</sup>**

| <b>Retain 50-foot Buffer</b> | <b>Retain &lt;50 and &gt;30 foot Buffer</b> | <b>Retain ≤ 30 foot Buffer</b>                         |
|------------------------------|---|--|
| No Additional Requirements   | Double Perimeter Controls                   | Double Perimeter Controls and 7-Day Site Stabilization |

**Small Residential Lot Compliance Alternative 2**

Alternative 2 specifies the controls that a builder of a small residential lot must implement based on both the buffer width retained and the site's sediment discharge risk. By incorporating the sediment risk, this approach may result in the implementation of controls that are more appropriate for the site's specific conditions.

**Step 1 – Determine Your Site's Sediment Risk Level**

To meet the requirements of Alternative 2, you must first determine your site's sediment discharge "risk level" based on the site's slope, location, and soil type. To help you to determine your site's sediment risk level, EPA developed five different tables for different slope conditions. You should select the table that most closely corresponds to your site's average slope.

*For example, if your site's average slope is 7 percent, you should use Table G-4 to determine your site's sediment risk.*

After you determine which table applies to your site, you must then use the table to determine the "risk level" (e.g., "low", "moderate", or "high") that corresponds to your site's location and predominant soil type.<sup>3</sup>

*For example, based on Table G-3, a site located in New Hampshire with a 4 percent average slope and with predominately sandy clay loam soils would fall into the "moderate" risk level.*

**<sup>2</sup> Description of Additional Controls Applicable to Small Residential Lot Compliance Alternatives 1 and 2:**

- **No Additional Requirements:** If you implement a buffer of 50 feet or greater, then you are not subject to any additional requirements. Note that you are required to install perimeter controls between the disturbed portions of your site and the buffer in accordance with Part 2.2.3.
- **Double Perimeter Control:** In addition to the reduced buffer width retained on your site, you must provide a double row of perimeter controls between the disturbed portion of your site and the water of the U.S. spaced a minimum of 5 feet apart.
- **Double Perimeter Control and 7-Day Site Stabilization:** In addition to the reduced buffer width retained on your site and the perimeter control implemented in accordance with Part 2.2.3, you must provide a double row of perimeter controls between the disturbed portion of your site and the water of the U.S. spaced a minimum of 5 feet apart, and you are required to complete the stabilization activities specified in Parts 2.2.14 within 7 calendar days of the temporary or permanent cessation of earth-disturbing activities.

<sup>3</sup> One source for determining your site's predominant soil type is the USDA's Web Soil Survey located at <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>.

**Table G-2 Risk Levels for Sites with Average Slopes of  $\leq 3$  Percent**

| Soil Type<br>Location              | Clay     | Silty Clay<br>Loam or Clay-<br>Loam | Sand     | Sandy Clay<br>Loam,<br>Loamy<br>Sand or<br>Silty Clay | Loam, Silt,<br>Sandy<br>Loam or Silt<br>Loam |
|------------------------------------|----------|-------------------------------------|----------|---|--|
| CNMI / Guam                        | Moderate | Moderate                            | Moderate | Moderate  | High   |
| Puerto Rico                        | Moderate | Moderate                            | Moderate | Moderate  | High   |
| Virgin Islands                     | Low      | Moderate                            | Low      | Moderate  | Moderate                                     |
| American Samoa                     | Moderate | Moderate                            | Moderate | Moderate  | High   |
| Massachusetts and New<br>Hampshire | Low      | Moderate                            | Low      | Low   | Moderate                                     |
| Idaho                              | Low      | Low                                 | Low      | Low   | Low  |
| New Mexico                         | Low      | Low                                 | Low      | Low   | Low  |
| Washington D.C.                    | Low      | Moderate                            | Low      | Low   | Moderate                                     |

**Table G-3 Risk Levels for Sites with Average Slopes of  $> 3$  Percent and  $\leq 6$  Percent**

| Soil Type<br>Location              | Clay     | Silty Clay<br>Loam or Clay-<br>Loam | Sand     | Sandy Clay<br>Loam,<br>Loamy<br>Sand or<br>Silty Clay | Loam, Silt,<br>Sandy<br>Loam or Silt<br>Loam |
|------------------------------------|----------|-------------------------------------|----------|---|--|
| CNMI / Guam                        | Moderate | Moderate                            | Moderate | Moderate  | High   |
| Puerto Rico                        | Moderate | Moderate                            | Moderate | Moderate  | High   |
| Virgin Islands                     | Moderate | Moderate                            | Moderate | Moderate  | High   |
| American Samoa                     | High     | High                                | Moderate | High  | High   |
| Massachusetts and New<br>Hampshire | Moderate | Moderate                            | Low      | Moderate  | High   |
| Idaho                              | Low      | Low                                 | Low      | Low   | Low  |
| New Mexico                         | Low      | Low                                 | Low      | Low   | Moderate                                     |
| Washington D.C.                    | Moderate | Moderate                            | Moderate | Moderate  | High   |

**Table G-4 Risk Levels for Sites with Average Slopes of > 6 Percent and ≤ 9 Percent**

| Soil Type<br>Location              | Clay     | Silty Clay<br>Loam or Clay-<br>Loam | Sand     | Sandy Clay<br>Loam,<br>Loamy<br>Sand or<br>Silty Clay | Loam, Silt,<br>Sandy Loam<br>or Silt Loam |
|------------------------------------|----------|-------------------------------------|----------|---|---|
| CNMI / Guam                        | Moderate | High                                | Moderate | High  | High                                      |
| Puerto Rico                        | Moderate | High                                | Moderate | Moderate  | High                                      |
| Virgin Islands                     | Moderate | Moderate                            | Moderate | Moderate  | High                                      |
| American Samoa                     | High     | High                                | High     | High  | High                                      |
| Massachusetts and New<br>Hampshire | Moderate | Moderate                            | Moderate | Moderate  | High                                      |
| Idaho                              | Low      | Low                                 | Low      | Low   | Low                                       |
| New Mexico                         | Low      | Low                                 | Low      | Low   | Moderate                                  |
| Washington D.C.                    | Moderate | Moderate                            | Moderate | Moderate  | High                                      |

**Table G-5 Risk Levels for Sites with Average Slopes of > 9 Percent and ≤ 15 Percent**

| Soil Type<br>Location              | Clay     | Silty Clay<br>Loam or Clay-<br>Loam | Sand     | Sandy Clay<br>Loam,<br>Loamy<br>Sand or<br>Silty Clay | Loam, Silt,<br>Sandy Loam<br>or Silt Loam |
|------------------------------------|----------|-------------------------------------|----------|---|---|
| CNMI / Guam                        | High     | High                                | High     | High  | High                                      |
| Puerto Rico                        | High     | High                                | High     | High  | High                                      |
| Virgin Islands                     | Moderate | High                                | Moderate | High  | High                                      |
| American Samoa                     | High     | High                                | High     | High  | High                                      |
| Massachusetts and New<br>Hampshire | Moderate | Moderate                            | Moderate | Moderate  | High                                      |
| Idaho                              | Low      | Low                                 | Low      | Low   | Low                                       |
| New Mexico                         | Low      | Moderate                            | Low      | Moderate  | Moderate                                  |
| Washington D.C.                    | Moderate | High                                | Moderate | Moderate  | High                                      |

**Table G-6 Risk Levels for Sites with Average Slopes of > 15 Percent**

| Soil Type<br>Location              | Clay     | Silty Clay<br>Loam or Clay-<br>Loam | Sand     | Sandy Clay<br>Loam,<br>Loamy<br>Sand or<br>Silty Clay | Loam, Silt,<br>Sandy Loam<br>or Silt Loam |
|------------------------------------|----------|-------------------------------------|----------|---|---|
| CNMI / Guam                        | High     | High                                | High     | High  | High                                      |
| Puerto Rico                        | High     | High                                | High     | High  | High                                      |
| Virgin Islands                     | High     | High                                | High     | High  | High                                      |
| American Samoa                     | High     | High                                | High     | High  | High                                      |
| Massachusetts and New<br>Hampshire | High     | High                                | Moderate | High  | High                                      |
| Idaho                              | Low      | Low                                 | Low      | Low   | Moderate                                  |
| New Mexico                         | Moderate | Moderate                            | Moderate | Moderate  | High                                      |
| Washington D.C.                    | High     | High                                | Moderate | High  | High                                      |

**Step 2 – Determine Which Additional Controls Apply**

Once you determine your site's "risk level", you must next determine the additional controls you need to implement on your site, based on the width of buffer you plan to retain. Table G-7 specifies the requirements that apply based on the "risk level" and buffer width retained. See footnote 3, above, for a description of the additional controls that are required.

*For example, if you are the operator of a small residential lot that falls into the "moderate" risk level, and you decide to retain a 20-foot buffer, using Table G-7 you would determine that you need to implement double perimeter controls to achieve compliance with small residential lot compliance alternative 2.*

You must also document in your SWPPP your compliance with small residential lot compliance alternative 2.

**Table G-7. Alternative 2 Requirements<sup>2</sup>**

| Risk Level Based<br>on Estimated Soil<br>Erosion | Retain ≥ 50' Buffer           | Retain <50' and<br>>30' Buffer | Retain ≤30' and<br>>10' Buffer                              | Retain ≤ 10' Buffer   |
|--|-------------------------------|--------------------------------|---|---|
| <b>Low Risk</b>                                  | No Additional<br>Requirements | No Additional<br>Requirements  | Double Perimeter<br>Control                                 | Double Perimeter<br>Control                                 |
| <b>Moderate Risk</b>                             | No Additional<br>Requirements | Double Perimeter<br>Control    | Double Perimeter<br>Control                                 | Double Perimeter<br>Control and 7-Day<br>Site Stabilization |
| <b>High Risk</b>                                 | No Additional<br>Requirements | Double Perimeter<br>Control    | Double Perimeter<br>Control and 7-Day<br>Site Stabilization | Double Perimeter<br>Control and 7-Day<br>Site Stabilization |

**ATTACHMENT 1****Sediment Removal Efficiency Tables<sup>4</sup>**

EPA recognizes that very high removal efficiencies, even where theoretically achievable by a 50-foot buffer, may be very difficult to achieve in practice using alternative controls. Therefore in the tables below, EPA has limited the removal efficiencies to a maximum of 90%. Efficiencies that were calculated at greater than 90% are shown as 90%, and this is the minimum percent removal that must be achieved by alternative controls.

**Table G-8 Estimated 50-foot Buffer Performance in Idaho\***

| Type of Buffer Vegetation**                                   | Estimated % Sediment Removal |                              |      |   |                                     |
|---|------------------------------|------------------------------|------|---|-------------------------------------|
|   | Clay                         | Silty Clay Loam or Clay-Loam | Sand | Sandy Clay Loam, Loamy Sand or Silty Clay | Loam, Silt, Sandy Loam or Silt Loam |
| Tall Fescue Grass   | 42                           | 52                           | 44   | 48  | 85                                  |
| Medium-density Weeds  | 28                           | 30                           | 28   | 26  | 60                                  |
| Low-density Warm-season Native Bunchgrass (i.e., Grama Grass) | 25                           | 26                           | 24   | 24  | 55                                  |
| Northern Mixed Prairie Grass                                  | 28                           | 30                           | 28   | 26  | 50                                  |
| Northern Range Cold Desert Shrubs                             | 28                           | 28                           | 24   | 26  | 50                                  |

\* Applicable for sites with less than nine percent slope

\*\* Characterization focuses on the under-story vegetation

**Table G-9 Estimated 50-foot Buffer Performance in Massachusetts and New Hampshire\***

| Type of Buffer Vegetation**  | Estimated % Sediment Removal |                              |      |   |                                     |
|--|------------------------------|------------------------------|------|---|-------------------------------------|
|  | Clay                         | Silty Clay Loam or Clay-Loam | Sand | Sandy Clay Loam, Loamy Sand or Silty Clay | Loam, Silt, Sandy Loam or Silt Loam |
| Warm-season Grass (i.e., Switchgrass, Lemongrass)                        | 79                           | 90                           | 90   | 90  | 90                                  |
| Cool-season Dense Grass (Kentucky Bluegrass, Smooth Bromegrass, Timothy) | 78                           | 90                           | 90   | 90  | 90                                  |
| Tall Fescue Grass  | 76                           | 90                           | 81   | 89  | 90                                  |
| Medium-density Weeds   | 66                           | 76                           | 60   | 72  | 66                                  |

\* Applicable for sites with less than nine percent slope

\*\* Characterization focuses on the under-story vegetation

<sup>4</sup> The buffer performances were calculated based on a denuded slope upgradient of a 50-foot buffer and a perimeter controls, as perimeter controls are a standard requirement (see Part 2.2.3).

**Table G-10 Estimated 50-foot Buffer Performance in New Mexico\***

| Type of Buffer Vegetation **                                  | Estimated % Sediment Removal |                              |      |   |                                     |
|---|------------------------------|------------------------------|------|---|-------------------------------------|
|   | Clay                         | Silty Clay Loam or Clay-Loam | Sand | Sandy Clay Loam, Loamy Sand or Silty Clay | Loam, Silt, Sandy Loam or Silt Loam |
| Tall Fescue grass   | 71                           | 85                           | 80   | 86  | 90                                  |
| Medium-density Weeds  | 56                           | 73                           | 55   | 66  | 78                                  |
| Low-density Warm-season Native Bunchgrass (i.e., Grama Grass) | 53                           | 70                           | 51   | 62  | 67                                  |
| Southern Mixed Prairie Grass                                  | 53                           | 71                           | 52   | 63  | 50                                  |
| Southern Range Cold Desert Shrubs                             | 56                           | 73                           | 55   | 65  | 53                                  |

\* Applicable for sites with less than nine percent slope

\*\* Characterization focuses on the under-story vegetation

**Table G-11 Estimated 50-foot Buffer Performance in Washington, DC\***

| Type of Buffer Vegetation **   | Estimated % Sediment Removal |                              |      |   |                                     |
|--|------------------------------|------------------------------|------|---|-------------------------------------|
|  | Clay                         | Silty Clay Loam or Clay-Loam | Sand | Sandy Clay Loam, Loamy Sand or Silty Clay | Loam, Silt, Sandy Loam or Silt Loam |
| Warm-season Grass (i.e., Switchgrass, Lemongrass)                        | 82                           | 90                           | 90   | 90  | 90                                  |
| Cool-season Dense Grass (Kentucky Bluegrass, Smooth Bromegrass, Timothy) | 81                           | 90                           | 90   | 90  | 90                                  |
| Tall Fescue Grass  | 79                           | 90                           | 83   | 89  | 90                                  |
| Medium-density Weeds   | 71                           | 79                           | 66   | 75  | 74                                  |

\* Applicable for sites with less than nine percent slope

\*\* Characterization focuses on the under-story vegetation

**Table G-12 Estimated 50-foot Buffer Performance in American Samoa\***

| Type of Buffer Vegetation **                      | Estimated % Sediment Removal |                              |      |   |                                     |
|---|------------------------------|------------------------------|------|---|-------------------------------------|
|   | Clay                         | Silty Clay Loam or Clay-Loam | Sand | Sandy Clay Loam, Loamy Sand or Silty Clay | Loam, Silt, Sandy Loam or Silt Loam |
| Bahiagrass (Permanent cover)                      | 82                           | 90                           | 90   | 90  | 83                                  |
| Warm-season Grass (i.e., Switchgrass, Lemongrass) | 82                           | 90                           | 90   | 90  | 85                                  |
| Dense Grass                                       | 82                           | 90                           | 90   | 90  | 83                                  |
| Tall Fescue Grass                                 | 82                           | 89                           | 82   | 89  | 79                                  |
| Medium-density Weeds                              | 70                           | 73                           | 62   | 75  | 59                                  |

\* Applicable for sites with less than nine percent slope

\*\* Characterization focuses on the under-story vegetation



**Table G-13 Estimated 50-foot Buffer Performance in CNMI and Guam\***

| Type of Buffer Vegetation **                             | Estimated % Sediment Removal |                              |      |   |                                     |
|--|------------------------------|------------------------------|------|---|-------------------------------------|
|  | Clay                         | Silty Clay Loam or Clay-Loam | Sand | Sandy Clay Loam, Loamy Sand or Silty Clay | Loam, Silt, Sandy Loam or Silt Loam |
| <b>Bahiagrass (Permanent cover)</b>                      | 80                           | 90                           | 90   | 90  | 89                                  |
| <b>Warm-season Grass (i.e., Switchgrass, Lemongrass)</b> | 80                           | 90                           | 90   | 90  | 90                                  |
| <b>Dense Grass</b>                                       | 79                           | 90                           | 90   | 90  | 89                                  |
| <b>Tall Fescue Grass</b>                                 | 76                           | 90                           | 80   | 88  | 87                                  |
| <b>Medium-density Weeds</b>                              | 63                           | 73                           | 53   | 68  | 61                                  |

\* Applicable for sites with less than nine percent slope

\*\* Characterization focuses on the under-story vegetation

**Table G-14 Estimated 50-foot Buffer Performance in Puerto Rico\***

| Type of Buffer Vegetation**                              | Estimated % Sediment Removal |                              |      |   |                                     |
|--|------------------------------|------------------------------|------|---|-------------------------------------|
|  | Clay                         | Silty Clay Loam or Clay-Loam | Sand | Sandy Clay Loam, Loamy Sand or Silty Clay | Loam, Silt, Sandy Loam or Silt Loam |
| <b>Bahiagrass (Permanent cover)</b>                      | 83                           | 90                           | 90   | 90  | 90                                  |
| <b>Warm-season Grass (i.e., Switchgrass, Lemongrass)</b> | 83                           | 90                           | 90   | 90  | 90                                  |
| <b>Dense Grass</b>                                       | 83                           | 90                           | 90   | 90  | 90                                  |
| <b>Tall Fescue Grass</b>                                 | 82                           | 90                           | 84   | 90  | 89                                  |
| <b>Medium-density Weeds</b>                              | 72                           | 78                           | 65   | 76  | 64                                  |

\* Applicable for sites with less than nine percent slope

\*\* Characterization focuses on the under-story vegetation

**Table G-15 Estimated 50-foot Buffer Performance in Virgin Islands\***

| Type of Buffer Vegetation**                              | Estimated % Sediment Removal |                              |      |   |                                     |
|--|------------------------------|------------------------------|------|---|-------------------------------------|
|  | Clay                         | Silty Clay Loam or Clay-Loam | Sand | Sandy Clay Loam, Loamy Sand or Silty Clay | Loam, Silt, Sandy Loam or Silt Loam |
| <b>Bahiagrass (Permanent cover)</b>                      | 85                           | 90                           | 90   | 90  | 90                                  |
| <b>Warm-season Grass (i.e., Switchgrass, Lemongrass)</b> | 86                           | 90                           | 90   | 90  | 90                                  |
| <b>Dense Grass</b>                                       | 85                           | 90                           | 90   | 90  | 90                                  |
| <b>Tall Fescue Grass</b>                                 | 85                           | 90                           | 88   | 90  | 89                                  |
| <b>Medium-density Weeds</b>                              | 75                           | 77                           | 71   | 78  | 63                                  |

\* Applicable for sites with less than nine percent slope

\*\* Characterization focuses on the under-story vegetation

**ATTACHMENT 2**Using the Sediment Removal Efficiency Tables – Questions and Answers

- *What if my specific buffer vegetation is not represented in Tables G-8 through G-15?* Tables G - 8 through G - 15 provide a wide range of factors affecting buffer performance; however, there are likely instances where the specific buffer vegetation type on your site is not listed. If you do not see a description of the type of vegetation present at your site, you should choose the vegetation type that most closely matches the vegetation type on your site. You can contact your local Cooperative Extension Service Office (<http://nifa.usda.gov/partners-and-extension-map>) for assistance in determining the vegetation type in Tables G-8 through G-15 that most closely matches your site-specific vegetation.
- *What if there is high variability in local soils?* EPA recognizes that there may be a number of different soil type(s) on any given construction site. General soil information can be obtained from USDA soil survey reports (<http://websoilsurvey.nrcs.usda.gov>) or from individual site assessments performed by a certified soil expert. Tables G-8 through G-15 present eleven generic soil texture classes, grouping individual textures where EPA has determined that performance is similar. If your site contains different soil texture classes, you should use the soil type that best approximates the predominant soil type at your site.
- *What if my site slope is greater than 9 percent after final grade is reached?* As indicated in the buffer performance tables, the estimated sediment removal efficiencies are associated with disturbed slopes of up to 9 percent grade. Where your graded site has an average slope of greater than 9 percent, you should calculate a site-specific buffer performance.
- *How do I calculate my own estimates for sediment reduction at my specific site?* If you determine that it is necessary to calculate your own sediment removal efficiency using site-specific conditions (e.g., slopes at your site are greater than 9 percent), you can use a range of available models that are available to facilitate this calculation, including USDA's RUSLE-series programs and the WEPP erosion model, SEDCAD, SEDIMOT, or other equivalent models.
- *What is my estimated buffer performance if my site location is not represented by Tables G-8 through G-15?* If your site is located in an area not represented by Tables G-8 through G-15, you should use the table that most closely approximates conditions at your site. You may instead choose to conduct a site-specific calculation of the buffer performance.
- *What if only a portion of my site drains to the buffer area?* If only a portion of your site drains to a water of the U.S., where that water is within 50 feet of your earth disturbances, you are only required to meet the equivalency requirement for the stormwater flows corresponding to those portions of the site. See Example 2 below for an example of how this is expected to work.

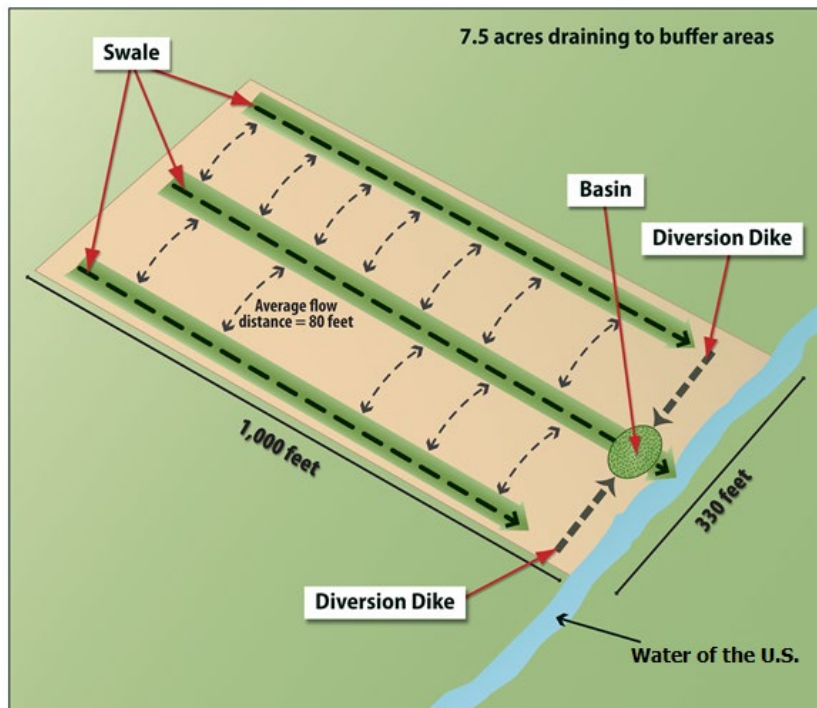
### ATTACHMENT 3

#### Examples of How to Use the Sediment Removal Efficiency Tables

##### Example 1. Comparatively Wet Location (7.5 acre site located in Massachusetts)

The operator of a 7.5-acre construction site in Massachusetts has determined that it is infeasible to establish a buffer of any size on the site, and is now required to select and install controls that will achieve an equivalent sediment load reduction as that estimated in G-9 for their site conditions. The first step is to identify what percentage of eroded sediment is estimated to be retained from a 50-foot buffer. For this example, it is assumed that the site has a relatively uniform gentle slope (3 percent), so Table G-9 can be used to estimate the 50-foot buffer sediment load reduction. If the site's buffer vegetation is best typified by cool-season dense grass and the underlying soil is of a type best described as loamy sand, the 50-foot buffer is projected to capture 90 percent of eroded sediment from the construction site.

The second step is to determine what sediment controls can be selected and installed in combination with the perimeter controls already required to be implemented at the site (see Part 2.2.3), which will achieve the 90 percent sediment removal efficiency from Table G-9. For this example, using the RUSLE2 profile model, it was determined that installing a pair of shallow-sloped diversion ditches to convey runoff to a well-designed and maintained sediment basin provides 99 percent sediment removal. Because the estimated sediment reduction is greater than the required 90 percent that a 50-foot buffer provides, the operator will have met the buffer requirements. See Figure G-5. The operator could also choose a different set of controls, as long as they achieve at least a 90 percent sediment removal efficiency.



**Figure G-5 Example 1 – Equivalent Sediment Load Reductions at a 7.5 ac Site in MA.**

##### Example 2. Arid Location With Pre-existing Disturbances in the Natural Buffer (6.5 acre site located in New Mexico)

An operator of a site in New Mexico determines that it is not feasible to provide a 50-foot buffer, but a 28-foot buffer can be provided. Because the operator will provide a buffer that is less than

50 feet, the operator must determine which controls, in combination with the 28-foot buffer, achieve a sediment load reduction equivalent to the 50-foot buffer. In this example, the project will disturb 6.5 acres of land, but only 1.5 acres of the total disturbed area drains to the buffer area. Within the 28-foot buffer area is a preexisting concrete walkway. Similar to Example 1, the equivalence analysis starts with Step 1 in Part G.2.4 of this Appendix with a review of the New Mexico buffer performance (Table G-10). The operator determines that the predominate vegetation type in the buffer area is prairie grass, the soil type is similar to silt, and the site is of a uniform, shallow slope (e.g., 3 percent grade). Although the operator will take credit for the disturbance caused by the concrete walkway as a natural buffer in Step 2, here the operator can treat the entire buffer area as being naturally vegetated with prairie grass. Based on this information, the operator refers to Table G-10 to estimate that the 50-foot buffer would retain 50 percent of eroded soil.

The second step is to determine, based on the 50 percent sediment removal efficiency found in Table G-10, what sediment controls, in combination with the 28-foot buffer area, can be implemented to reduce sediment loads by 50 percent or more. The operator does not have to account the reduction in buffer function caused by the preexisting walkway, and can take credit for the entire 28-foot buffer being fully vegetated in the analysis. For this example, using the RUSLE2 profile model, the operator determined that installing a fiber roll barrier between the silt fence (already required by Part 2.2.3) and the 28-foot buffer will achieve an estimated 84 percent sediment removal efficiency. See Figure G-6. Note that this operator is subject to the requirement in Part G.2.3 of this Appendix to ensure that discharges through the silt fence, fiber roll barrier, and 28-foot buffer do not cause erosion within the buffer. The estimated sediment reduction is greater than the required 50 percent; therefore the operator will have met the buffer alternative requirement.

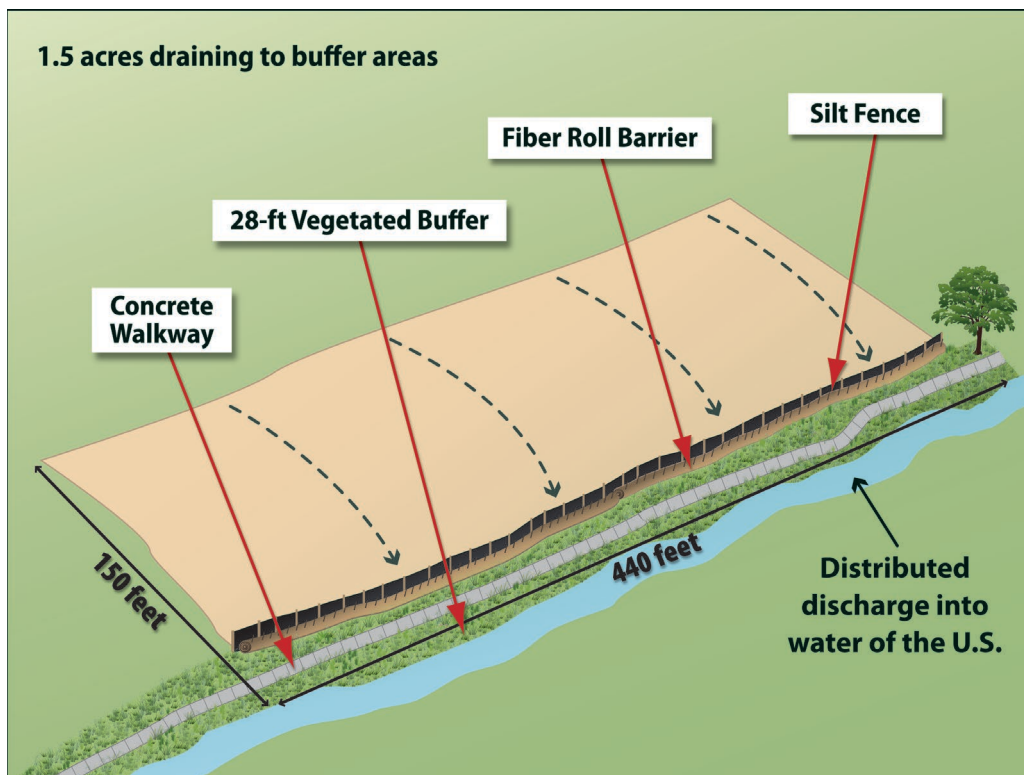


Figure G-6 Example 2 – Equivalent Sediment Load Reductions at a 6.5 ac Site in NM.

## Appendix H – 2-Year, 24-Hour Storm Frequencies

Part 2.2.12 of the permit indicates that if you install a sediment basin, one of the design requirements is to provide storage for either (1) the calculated volume of runoff from a 2-year, 24-hour storm, or (2) 3,600 cubic feet per acre drained. This appendix is intended to provide a guide to permittees to determine the volume of precipitation associated with their local 2-year, 24-hour storm event.

The permittee should start out by determining their local 2-year, 24-hour storm volume. The rainfall frequency atlases, technical papers, and the Precipitation Frequency Data Server (PFDS) developed by the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) serve as national standards for rainfall intensity at specified frequencies and durations in the United States. Table H-1 identifies methods for determining precipitation frequency based on permit area. EPA notes that permittees may also use alternative peer-reviewed data sources not listed in Table H - 1 to determine the 2-year, 24-hour storm for their site.

**Table H -1 – Method to Determine Precipitation Frequency Based on Permit Area**

| <b>PERMIT AREA</b>                     | <b>METHOD TO DETERMINE PRECIPITATION FREQUENCY</b> |
|--|--|
| District of Columbia                   | PFDS; NOAA Atlas 14, Vol. 2                        |
| Idaho                                  | NOAA Atlas 2, Vol. 5; Technical Paper 40           |
| Massachusetts                          | Technical Paper 40                                 |
| New Hampshire                          | Technical Paper 40                                 |
| New Mexico                             | PFDS; Technical Paper 40                           |
| Selected Pacific Islands               | PFDS; Technical Paper 40                           |
| Puerto Rico and the U.S Virgin Islands | PFDS; Technical Paper 40                           |
| Other                                  | PFDS; Technical Paper 40; NOAA Atlas 2 or 14       |

### How to Determine Your Local 2-year, 24-hour Storm Size

Projects located in the **District of Columbia, Massachusetts, New Hampshire, New Mexico, Puerto Rico, U.S. Virgin Islands, or Pacific Islands** can use the PFDS at <http://hdsc.nws.noaa.gov/hdsc/pfds/index.html> or the appropriate NOAA's Atlas 14 Volume at <http://www.nws.noaa.gov/oh/hdsc/currentpf.htm> to determine their precipitation frequency.

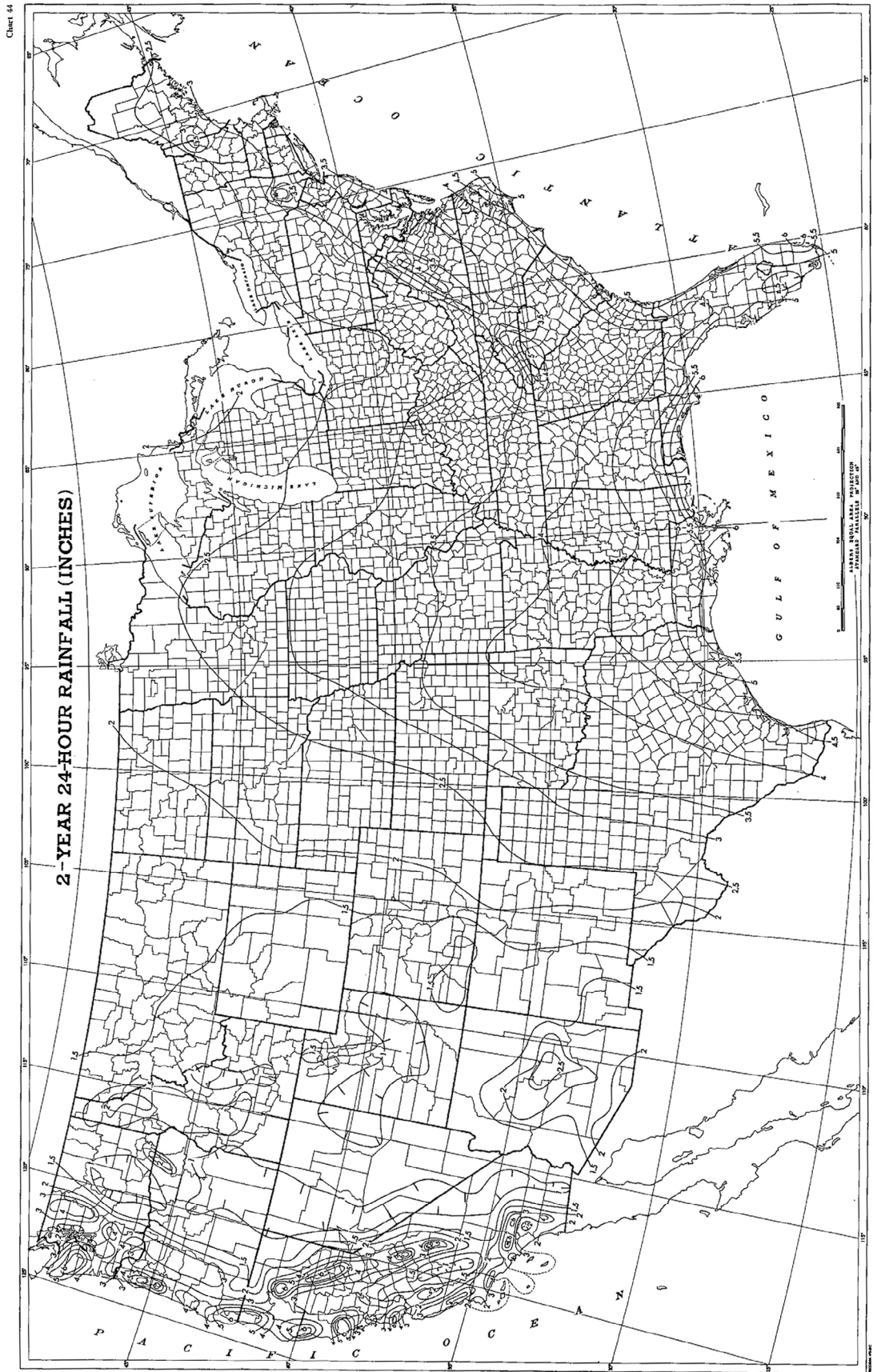
The PFDS is an easy to use, point-and-click interface to official U.S. precipitation frequency estimates and intensities. The opening PFDS screen is a clickable map of the United States. Upon clicking on a state, a state-specific interface appears. From this page the user selects the following:

- A location: Either via clicking on the map or manually entering a longitude/latitude coordinate;
- Data type: precipitation depth or precipitation intensity
- Units: english or metric; and
- Time series type: partial duration or annual maximum.

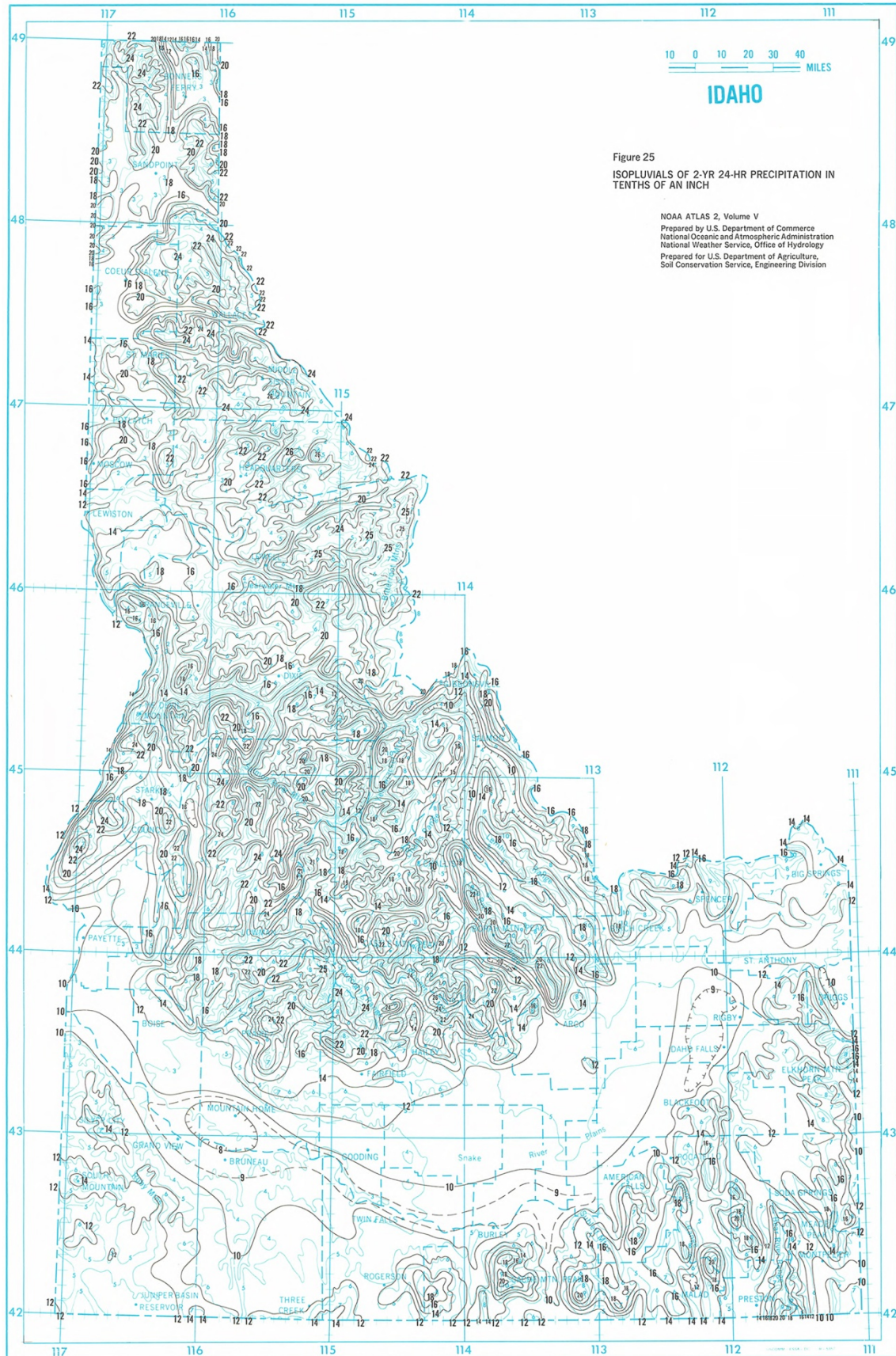
Additionally, PFDS also serves as a tool for providing references and other information for other current precipitation frequency standards that are not yet updated.

Projects located in **Idaho** can use the NOAA Atlas 2, Vol. 5 to determine their precipitation frequency. NOTE: Precipitation Frequencies on the NOAA Atlas 2, Vol. 5 are in tenths of an inch and will have to be converted to inches to determine precipitation frequency. NOAA Atlas 2, Vol. 5 can be accessed at [http://www.nws.noaa.gov/oh/hdsc/PF\\_documents/Atlas2\\_Volume5.pdf](http://www.nws.noaa.gov/oh/hdsc/PF_documents/Atlas2_Volume5.pdf). (See also attached map of NOAA Atlas 2, Vol. 5)

Projects located in areas not covered by the PFDS or NOAA Atlases will need to use TP-40 to identify the precipitation frequency. TP-40 provides a map of the continental U.S. for the 2-year, 24-hour rainfall. TP40 can be accessed at [http://www.nws.noaa.gov/oh/hdsc/PF\\_documents/TechnicalPaper\\_No40.pdf](http://www.nws.noaa.gov/oh/hdsc/PF_documents/TechnicalPaper_No40.pdf). (See also attached map of TP-40)









## Appendix I - Standard Permit Conditions

Standard permit conditions in Appendix I are consistent with the general permit provisions required under 40 CFR 122.41.

### I.1 Duty To Comply.

You must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

**I.1.1** You must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards, even if the permit has not yet been modified to incorporate the requirement.

**I.1.2** Penalties for Violations of Permit Conditions: The Director will adjust the civil and administrative penalties listed below in accordance with the Civil Monetary Penalty Inflation Adjustment Rule (61 FR 252, December 31, 1996, pp. 69359-69366, as corrected in 62 FR 54, March 20, 1997, pp.13514-13517) as mandated by the Debt Collection Improvement Act of 1996 for inflation on a periodic basis. This rule allows EPA's penalties to keep pace with inflation. The Agency is required to review its penalties at least once every 4 years thereafter and to adjust them as necessary for inflation according to a specified formula. The civil and administrative penalties following were adjusted for inflation starting in 1996.

#### I.1.2.1 *Criminal Penalties.*

- a. *Negligent Violations.* The CWA provides that any person who negligently violates permit conditions implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to criminal penalties of not less than \$2,500 nor more than \$25,000 per day of violation, or imprisonment of not more than one year, or both. In the case of a second or subsequent conviction for a negligent violation, a person shall be subject to criminal penalties of not more than \$50,000 per day of violation or by imprisonment of not more than two years, or both.
- b. *Knowing Violations.* The CWA provides that any person who knowingly violates permit conditions implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to a fine of not less than \$5,000 nor more than \$50,000 per day of violation, or by imprisonment for not more than 3 years, or both. In the case of a second or subsequent conviction for a knowing violation, a person shall be subject to criminal penalties of not more than \$100,000 per day of violation, or imprisonment of not more than 6 years, or both.
- c. *Knowing Endangerment.* The CWA provides that any person who knowingly violates permit conditions implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act and who knows at that time that he or she is placing another person in imminent danger of death or serious bodily injury shall upon conviction be subject to a fine of not more than \$250,000 or by imprisonment of not more than 15 years, or both. In the case of a second or subsequent conviction for a knowing endangerment violation, a person shall be subject to a fine of not more than \$500,000 or by imprisonment of not more than 30 years, or both. An organization, as defined in Section 309(c)(3)(B)(iii) of the Act, shall, upon conviction of violating the imminent danger provision be subject to a fine of not

more than \$1,000,000 and can be fined up to \$2,000,000 for second or subsequent convictions.

- d. *False Statement.* The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than \$20,000 per day of violation, or by imprisonment of not more than 4 years, or both. The Act further provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

I.1.2.2 *Civil Penalties.* The CWA provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to a civil penalty not to exceed the maximum amount authorized by Section 309(d) of the Act, as adjusted pursuant to the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note) as amended (28 U.S.C. § 2461 note), and codified at 40 CFR § 19.4.

I.1.2.3 *Administrative Penalties.* The CWA provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to an administrative penalty, as follows

- a. *Class I Penalty.* Not to exceed the maximum amounts authorized by Section 309(g)(2)(A) of the Act, as adjusted pursuant to the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note), as amended (28 U.S.C. § 2461 note), and codified at 40 CFR § 19.4.
- b. *Class II Penalty.* Not to exceed the maximum amounts authorized by Section 309(g)(2)(B) of the Act, as adjusted pursuant to the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note), as amended, (28 U.S.C. § 2461 note), and codified at 40 CFR § 19.4.

## **I.2 Duty to Reapply.**

If you wish to continue an activity regulated by this permit after the expiration date of this permit, you must apply for and obtain authorization as required by the new permit once EPA issues it.

## **I.3 Need to Halt or Reduce Activity Not a Defense.**

It shall not be a defense for you in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

## **I.4 Duty to Mitigate.**

You must take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

**I.5 Proper Operation and Maintenance.**

You must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by you to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are installed by you only when the operation is necessary to achieve compliance with the conditions of this permit.

**I.6 Permit Actions.**

This permit may be modified, revoked and reissued, or terminated for cause. Your filing of a request for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

**I.7 Property Rights.**

This permit does not convey any property rights of any sort, or any exclusive privileges.

**I.8 Duty to Provide Information.**

You must furnish to EPA or an authorized representative (including an authorized contractor acting as a representative of EPA), within a reasonable time, any information that EPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. You must also furnish to EPA or an authorized representative upon request, copies of records required to be kept by this permit.

**I.9 Inspection and Entry.**

You must allow EPA or an authorized representative (including an authorized contractor acting as a representative of EPA), upon presentation of credentials and other documents as may be required by law, to:

- I.9.1** Enter upon your premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
- I.9.2** Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
- I.9.3** Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
- I.9.4** Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

**I.10 Monitoring and Records.**

- I.10.1** Samples and measurements taken for the purpose of monitoring must be representative of the volume and nature of the monitored activity.
- I.10.2** You must retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date the permit expires or the date the permittee's authorization is terminated. This period may be extended by request of EPA at any time.

**I.10.3** Records of monitoring information must include:

- I.10.3.1 The date, exact place, and time of sampling or measurements;
- I.10.3.2 The individual(s) who performed the sampling or measurements;
- I.10.3.3 The date(s) analyses were performed
- I.10.3.4 The individual(s) who performed the analyses;
- I.10.3.5 The analytical techniques or methods used; and
- I.10.3.6 The results of such analyses.

**I.10.4** Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in the permit.

**I.10.5** The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than \$20,000 per day of violation, or by imprisonment of not more than 4 years, or both.

**I.11 Signatory Requirements.**

**I.11.1** All applications, including NOIs, must be signed as follows:

I.11.1.1 For a corporation: By a responsible corporate officer. For the purpose of this subsection, a responsible corporate officer means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

I.11.1.2 For a partnership or sole proprietorship: By a general partner or the proprietor, respectively; or

I.11.1.3 For a municipality, state, federal, or other public agency: By either a principal executive officer or ranking elected official. For purposes of this subsection, a principal executive officer of a federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrator of EPA).

**I.11.2** Your SWPPP, including changes to your SWPPP, inspection reports, and any other compliance documentation required under this permit, must be signed by a person described in Appendix I, Subsection I.11.1 above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

I.11.2.1 The authorization is made in writing by a person described in Appendix I, Subsection I.11.1;

- I.11.2.2 The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and
- I.11.2.3 The signed and dated written authorization is included in the SWPPP. A copy must be submitted to EPA, if requested.
- I.11.3** Changes to Authorization. If an authorization under this permit is no longer accurate because a different operator has responsibility for the overall operation of the construction site, a new NOI must be submitted to EPA. See Table 1 in Part 1.4.2 of the permit. However, if the only change that is occurring is a change in contact information or a change in the facility's address, the operator need only make a modification to the existing NOI submitted for authorization.
- I.11.4** Any person signing documents in accordance with Appendix I, Subsections I.11.1 or I.11.2 above must include the following certification:
- "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information contained therein. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information contained is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."
- I.11.5** For persons signing NOIs electronically, in addition to meeting other applicable requirements in Appendix I, Subsection I.11, such signatures must meet the same signature, authentication, and identity-proofing standards set forth at 40 CFR § 3.2000(b) for electronic reports (including robust second-factor authentication).
- I.11.6** The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.
- I.12 Reporting Requirements.**
- I.12.1** Planned changes. You must give notice to EPA as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:
- I.12.1.1 The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR 122.29(b); or
- I.12.1.2 The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR 122.42(a)(1).

- I.12.2** Anticipated noncompliance. You must give advance notice to EPA of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.
- I.12.3** Transfers. This permit is not transferable to any person except after notice to EPA. Where a facility wants to change the name of the permittee, the original permittee (the first owner or operators) must submit a Notice of Termination pursuant to Part 8. The new owner or operator must submit a Notice of Intent in accordance with Part 1.7 and Table 1. See also requirements in Appendix I, Subsections I.11.1 and I.11.2.
- I.12.4** Monitoring reports. Monitoring results must be reported at the intervals specified elsewhere in this permit.
- I.12.4.1** Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms provided or specified by EPA for reporting results of monitoring of sludge use or disposal practices.
- I.12.4.2** If you monitor any pollutant more frequently than required by the permit using test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR 136 unless otherwise specified in 40 CFR Part 503, or as specified in the permit, the results of this monitoring must be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by EPA.
- I.12.5** Compliance schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than 14 days following each schedule date.
- I.12.6** Twenty-four hour reporting. In addition to reports required elsewhere in this permit:
- I.12.6.1** You must report any noncompliance which may endanger health or the environment directly to the EPA Regional Office (see contacts at <https://www2.epa.gov/national-pollutant-discharge-elimination-system-npdes/contact-us-stormwater#regional>). Any information must be provided orally within 24 hours from the time you become aware of the circumstances. A written submission must also be provided within five days of the time you become aware of the circumstances. The written submission must contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.
- I.12.6.2** The following shall be included as information which must be reported within 24 hours under this paragraph.
- Any unanticipated bypass which exceeds any effluent limitation in the permit. (See 40 CFR 122.41(m)(3)(ii))
  - Any upset which exceeds any effluent limitation in the permit
  - Violation of a maximum daily discharge limit for any numeric effluent limitation. (See 40 CFR 122.44(g).)
- I.12.6.3** EPA may waive the written report on a case-by-case basis for reports under Appendix I, Subsection I.12.6.2 if the oral report has been received within 24 hours.
- I.12.7** Other noncompliance. You must report all instances of noncompliance not reported under Appendix I, Subsections I.12.4, I.12.5, and I.12.6, at the time monitoring reports are submitted. The reports must contain the information listed in Appendix I, Subsection I.12.6.
- I.12.8** Other information. Where you become aware that you failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application

or in any report to the Permitting Authority, you must promptly submit such facts or information.

### **I.13 Bypass.**

#### **I.13.1 Definitions.**

I.13.1.1 Bypass means the intentional diversion of waste streams from any portion of a treatment facility See 40 CFR 122.41 (m)(1)(i).

I.13.1.2 Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production. See 40 CFR 122.41 (m)(1)(ii).

**I.13.2** Bypass not exceeding limitations. You may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Appendix I, Subsections I.13.3 and I.13.4. See 40 CFR 122.41 (m)(2).

#### **I.13.3 Notice.**

I.13.3.1 Anticipated bypass. If you know in advance of the need for a bypass, you must submit prior notice, if possible at least ten days before the date of the bypass. See 40 CFR 122.41 (m)(3)(i).

I.13.3.2 Unanticipated bypass. You must submit notice of an unanticipated bypass as required in Appendix I, Subsection I.12.6 (24-hour notice). See 40 CFR 122.41 (m)(3)(ii).

**I.13.4** Prohibition of bypass. See 40 CFR 122.41 (m)(4).

I.13.4.1 Bypass is prohibited, and EPA may take enforcement action against you for bypass, unless:

- a. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
- b. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
- c. You submitted notices as required under Appendix I, Subsection I.13.3.

I.13.4.2 EPA may approve an anticipated bypass, after considering its adverse effects, if EPA determines that it will meet the three conditions listed above in Appendix I, Subsection I.13.4.1.

### **I.14 Upset.**

**I.14.1** Definition. Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond your reasonable control. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation. See 40 CFR 122.41 (n)(1).

**I.14.2** Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of Appendix I, Subsection I.14.3 are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review. See 40 CFR 122.41(n)(2).

**I.14.3** Conditions necessary for a demonstration of upset. See 40 CFR 122.41(n)(3). A permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

I.14.3.1 An upset occurred and that you can identify the cause(s) of the upset;

I.14.3.2 The permitted facility was at the time being properly operated; and

I.14.3.3 You submitted notice of the upset as required in Appendix I, Subsection I.12.6.2.b (24 hour notice).

I.14.3.4 You complied with any remedial measures required under Appendix I, Subsection I.4.

**I.14.4** Burden of proof. In any enforcement proceeding, you, as the one seeking to establish the occurrence of an upset, have the burden of proof. See 40 CFR 122.41(n)(4).

## **I.15 Retention of Records.**

Copies of the SWPPP and all documentation required by this permit, including records of all data used to complete the NOI to be covered by this permit, must be retained for at least three years from the date that permit coverage expires or is terminated. This period may be extended by request of EPA at any time.

## **I.16 Reopener Clause.**

**I.16.1** Procedures for modification or revocation. Permit modification or revocation will be conducted according to 40 CFR § 122.62, § 122.63, § 122.64 and § 124.5.

**I.16.2** Water quality protection. If there is evidence indicating that the stormwater discharges authorized by this permit cause, have the reasonable potential to cause or contribute to an excursion above any applicable water quality standard, you may be required to obtain an individual permit, or the permit may be modified to include different limitations and/or requirements.

**I.16.3** Timing of permit modification. EPA may elect to modify the permit prior to its expiration (rather than waiting for the new permit cycle) to comply with any new statutory or regulatory requirements, such as for effluent limitation guidelines that may be promulgated in the course of the current permit cycle.

## **I.17 Severability.**

Invalidation of a portion of this permit does not necessarily render the whole permit invalid. EPA's intent is that the permit is to remain in effect to the extent possible; in the event that any part of this permit is invalidated, EPA will advise the regulated community as to the effect of such invalidation.



### **Appendix J - Notice of Intent (NOI) Form and Instructions**

Part 1.4.1 requires you to use the NPDES eReporting Tool, or "NeT" system, to prepare and submit your NOI electronically. However, if the EPA Regional Office grants you a waiver to use a paper NOI form, and you elect to use it, you must complete and submit the following form.

|                         |   |  |                                     |
|-------------------------|---|--|-------------------------------------|
| NPDES<br>FORM<br>3510-9 |  | UNITED STATES ENVIRONMENTAL PROTECTION AGENCY<br>WASHINGTON, DC 20460<br>NOTICE OF INTENT FOR THE 2017 NPDES CONSTRUCTION GENERAL PERMIT | Form Approved.<br>OMB No. 2040-0004 |
|-------------------------|---|--|-------------------------------------|

Submission of this Notice of Intent (NOI) constitutes notice that the operator identified in Section III of this form requests authorization to discharge pursuant to the NPDES Construction General Permit (CGP) permit number identified in Section II of this form. Submission of this NOI also constitutes notice that the operator identified in Section III of this form meets the eligibility requirements of Part 1.1 CGP for the project identified in Section IV of this form. Permit coverage is required prior to commencement of construction activity until you are eligible to terminate coverage as detailed in Part 8 of the CGP. To obtain authorization, you must submit a complete and accurate NOI form. Discharges are not authorized if your NOI is incomplete or inaccurate or if you were never eligible for permit coverage. Refer to the instructions at the end of this form.

### I. Approval to Use Paper NOI Form

Have you been granted a waiver from electronic reporting from the Regional Office \*? ☐ YES ☐ NO

If yes, check which waiver you have been granted, , the name of the EPA Regional Office staff person who granted the waiver, and the date of approval:

Waiver granted: ☐ The owner/operator's headquarters is physically located in a geographic area (i.e., ZIP code or census tract) that is identified as under-served for broadband Internet access in the most recent report from the Federal Communications Commission.

☐ The owner/operator has issues regarding available computer access or computer capability.

Name of EPA staff person that granted the waiver:

Date approval obtained:

**\* Note: You are required to obtain approval from the applicable Regional Office prior to using this paper NOI form. If you have not obtained a waiver, you must file this form electronically using the NPDES eReporting Tool (NeT).**

### II. Permit Information

NPDES ID (EPA Use Only):

Master Permit Number: 



 (see Appendix B of the CGP for the list of eligible permit numbers)

### III. Operator Information

**Operator Information**

Operator Name:

Are you requesting coverage under this NOI as a "federal operator" as defined in Appendix A? ☐ YES ☐ NO

Mailing Address:

Street:

City: 



 State: 



 ZIP Code: 



 -

County or Similar Government Division:

Phone: 



 - 



 - 



 Ext.

E-mail:

Operator Point of Contact Information:

First Name, Middle Initial, Last Name:

Title:

**NOI Preparer (Complete if NOI was prepared by someone other than the certifier):**

First Name, Middle Initial, Last Name:

Organization:

Phone: 



 - 



 - 



 Ext.

E-mail:

#### IV. Project/Site Information

Project/Site Name:

##### Project/Site Address:

Street/Location:

City:  State:  ZIP Code:  -

County or Similar Government Subdivision:

For the project/site you are seeking permit coverage, provide the following information:

Latitude/Longitude (Use decimal degrees and specify method):

Latitude:  ° N (decimal degrees) Longitude:  ° W (decimal degrees)

Latitude/Longitude Data Source: ☐ Map ☐ GPS ☐ Other \_\_\_\_\_ Horizontal Reference Datum: ☐ NAD 27 ☐ NAD 83 ☐ WGS 84

Is your project/site located in Indian country lands, or located on a property of religious or cultural significance to an Indian tribe? ☐ YES ☐ NO

If yes, provide the name of the Indian tribe associated with the area of Indian country (including name of Indian reservation, if applicable), or if not in Indian country, provide the name of the Indian tribe associated with the property:

Estimated Project Start Date:  /  /  Estimated Project Completion Date:  /  /

Estimated Area to be Disturbed (to the nearest quarter acre):  .

Type of Construction Site (check all that apply): ☐ Single-Family Residential ☐ Multi-Family Residential ☐ Commercial ☐ Industrial

☐ Institutional ☐ Highway or Road ☐ Utility ☐ Other

Will there be demolition of any structure built or renovated before January 1, 1980? ☐ YES ☐ NO

If yes, do any of the structures being demolished have at least 10,000 square feet of floor space? ☐ YES ☐ NO

Was the pre-development land use used for agriculture (see Appendix A for definition of "agricultural land")? ☐ YES ☐ NO

Have earth-disturbing activities commenced on your project/site? ☐ YES ☐ NO

If yes, is your project an "emergency-related project" (see Appendix A)? ☐ YES ☐ NO

Have stormwater discharges from your project/site been covered previously under an NPDES permit? ☐ YES ☐ NO

If yes, provide the NPDES ID (if you had coverage under EPA's 2012 CGP or the NPDES permit number if you had coverage under an EPA individual permit:

#### V. Discharge Information

By indicating "Yes" below, I confirm that I understand that the CGP only authorizes the allowable stormwater discharges in Part 1.2.1 and the allowable non-stormwater discharges listed in Part 1.2.2. Any discharges not expressly authorized in this permit cannot become authorized or shielded from liability under CWA section 402(k) by disclosure to EPA, state, or local authorities after issuance of this permit via any means, including the Notice of Intent (NOI) to be covered by the permit, the Stormwater Pollution Prevention Plan (SWPPP), during an inspection, etc. If any discharges requiring NPDES permit coverage other than the allowable stormwater and non-stormwater discharges listed in Parts 1.2.1 and 1.2.2 will be discharged, they must be covered under another NPDES permit.

☐ YES

Does your project/site discharge stormwater into a Municipal Separate Storm Sewer System (MS4)? ☐ YES ☐ NO

Are there any waters of the U.S. within 50 feet of your project's earth disturbances? ☐ YES ☐ NO

| Receiving Waters Information: (Attach a separate list if necessary) |  |   |   |
|---|--|---|---|
| Point of Discharge ID   | For each point of discharge, provide the following receiving water information:  |   |   |
|   | Provide the name of the first water of the U.S. that receives stormwater directly from the point of discharge and/or from the MS4 that the point of discharge discharges to: | If the receiving water is impaired (on the CWA 303(d) list), list the pollutants that are causing the impairment: | If a TMDL been completed for this receiving waterbody, providing the following information: |
|   |  |   | TMDL Name and ID:<br><br>Pollutant(s) for which there is a TMDL:                            |
|   |  |   | TMDL Name and ID:<br><br>Pollutant(s) for which there is a TMDL:                            |
|   |  |   | TMDL Name and ID:<br><br>Pollutant(s) for which there is a TMDL:                            |
|   |  |   | TMDL Name and ID:<br><br>Pollutant(s) for which there is a TMDL:                            |

|  |  |  |  |
|--|--|--|--|
|  |  |  | <b>TMDL Name and ID:</b><br><br><b>Pollutant(s) for which there is a TMDL:</b> |
|  |  |  | <b>TMDL Name and ID:</b><br><br><b>Pollutant(s) for which there is a TMDL:</b> |

Are any of the waters of the U.S. to which you discharge designated by the state or tribal authority under its antidegradation policy as a Tier 2 (or Tier 2.5) water (water quality exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water) or as a Tier 3 water (Outstanding National Resource Water)? (See Appendix F).

☐ YES ☐ NO

If yes, name(s) of receiving water(s) and its designation (Tier 2, Tier 2.5 or Tier 3):

#### VI. Chemical Treatment Information

Will you use polymers, flocculants, or other treatment chemicals at your construction site? ☐ YES ☐ NO

If yes, will you use cationic treatment chemicals at your construction site\*? ☐ YES ☐ NO

If yes, have you been authorized to use cationic treatment chemicals by your applicable EPA Regional Office in advance of filing your NOI\*?

☐ YES ☐ NO

If you have been authorized to use cationic treatment chemicals by your applicable EPA Regional Office, attach a copy of your authorization letter and include documentation of the appropriate controls and implementation procedures designed to ensure that your use of cationic treatment chemicals will not lead to a violation of water quality standards.

Please indicate the treatment chemicals that you will use:

\* Note: You are ineligible for coverage under this permit unless you notify your applicable EPA Regional Office in advance and the EPA office authorizes coverage under this permit after you have included appropriate controls and implementation procedures designed to ensure that your use of cationic treatment chemicals will not lead to a violation of water quality standards.

#### VII. Stormwater Pollution Prevention Plan (SWPPP) Information

Has the SWPPP been prepared in advance of filing this NOI, as required? ☐ YES ☐ NO

##### SWPPP Contact Information:

First Name, Middle Initial Last Name:

Professional Title:

Phone:  -  -  Ext.

E-mail:

## VIII. Endangered Species Protection

Using the instructions in Appendix D of the CGP, under which criterion listed below are you eligible for coverage under this permit? Check only 1 box, include the required information and provide a sound basis for supporting the criterion selected. You must consider Endangered Species Act listed threatened or endangered species (ESA-listed) and/or designated critical habitat(s) under the jurisdiction of both the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) and select the most conservative criterion that applies.

- ☐ **A** No ESA-listed species and/or designated critical habitat present in action area. Using the process outlined in Appendix D of this permit, you certify that ESA-listed species and designated critical habitat(s) under the jurisdiction of the USFWS or NMFS are not likely to occur in your site's "action area" as defined in Appendix A of this permit. **[Basis statement content: A basis statement supporting the selection of this criterion should identify the USFWS and NMFS information sources used. Attaching aerial image(s) of the site to this NOI is helpful to EPA, USFWS, and NMFS in confirming eligibility under this criterion. Please Note: NMFS' jurisdiction includes ESA-listed marine and estuarine species that spawn in inland rivers.]**
- ☐ **B** Eligibility requirements met by another operator under the 2017 CGP. The construction site's discharges and discharge-related activities were already addressed in another operator's valid certification of eligibility for your "action area" under eligibility Criterion A, C, D, E, or F of the 2017 CGP and you have confirmed that no additional ESA-listed species and/or designated critical habitat under the jurisdiction of USFWS and/or NMFS not considered in the that certification may be present or located in the "action area." To certify your eligibility under this criterion, there must be no lapse of NPDES permit coverage in the other CGP operator's certification. By certifying eligibility under this criterion, you agree to comply with any conditions upon which the other CGP operator's certification was based. You must include in your NOI the NPDES ID from the other 2017CGP operator's notification of authorization under this permit. If your certification is based on another 2017 CGP operator's certification under criterion C, you must provide EPA with the relevant supporting information required of existing dischargers in criterion C in your NOI form. **[Basis statement content: A basis statement supporting the selection of this criterion should identify the eligibility criterion of the other CGP NOI, the authorization date, and confirmation that the authorization is effective.]**

If you select criterion B, provide the NPDES ID from the other operator's notification of authorization under this permit:

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|

- ☐ **C** Discharges not likely to adversely affect ESA-listed species and/or designated critical habitat. ESA-listed species and/or designated critical habitat(s) under the jurisdiction of the USFWS and/or NMFS are likely to occur in or near your site's "action area," and you certify to EPA that your site's discharges and discharge-related activities are not likely to adversely affect ESA-listed threatened or endangered species and/or designated critical habitat. This certification may include consideration of any stormwater controls and/or management practices you will adopt to ensure that your discharges and discharge-related activities are not likely to adversely affect ESA-listed species and/or designated critical habitat. To certify your eligibility under this criterion, indicate 1) the ESA-listed species and/or designated habitat located in your "action area" using the process outlined in Appendix D of this permit; 2) the distance between the site and the listed species and/or designated critical habitat in the action area (in miles); and 3) a rationale describing specifically how adverse effects to ESA-listed species will be avoided from the discharges and discharge-related activities. You must also include a copy of your site map from your SWPPP showing the upland and in-water extent of your "action area" with this NOI. **[Basis statement content: A basis statement supporting the selection of this criterion should identify the information resources and expertise (e.g., state or federal biologists) used to arrive at this conclusion. Any supporting documentation should explicitly state that both ESA-listed species and designated critical habitat under the jurisdiction of the USFWS and/or NMFS were considered in the evaluation.]**

What ESA-listed species and/or designated critical habitat are located in your "action area":

Distance between your site and the ESA-listed species and/or designated critical habitat within the action area (in miles, state "on site" if the ESA-listed species and/or designated critical habitat is within the area to be disturbed):

- ☐ **D** Coordination with USFWS and/or NMFS has successfully concluded. Coordination between you and the USFWS and/or NMFS has concluded. The coordination must have addressed the effects of your site's discharges and discharge-related activities on ESA-listed species and/or designated critical habitat under the jurisdiction of USFWS and/or NMFS, and resulted in a written concurrence from USFWS and/or NMFS that your site's discharges and discharge-related activities are not likely to adversely affect listed species and/or critical habitat. You must include copies of the correspondence with the participating agencies in your SWPPP and this NOI. **[Basis statement content: A basis statement supporting the selection of this criterion should identify whether USFWS or NMFS or both agencies participated in coordination, the field office/regional office(s) providing that coordination, and the date that coordination concluded.]**
- ☐ **E** ESA Section 7 consultation has successfully concluded. Consultation between a Federal Agency and the USFWS and/or NMFS under section 7 of the ESA has concluded. The consultation must have addressed the effects of the construction site's discharges and discharge-related activities on ESA-listed species and/or designated critical habitat under the jurisdiction of USFWS and/or NMFS. To certify eligibility under this criterion, indicate the result of the consultation:
- ☐ biological opinion from USFWS and/or NMFS that concludes that the action in question (taking into account the effects of your site's discharges and discharge-related activities) is not likely to jeopardize the continued existence of listed species, nor the destruction or adverse modification of critical habitat; or
- ☐ written concurrence from USFWS and/or NMFS with a finding that the site's discharges and discharge-related activities are not likely to adversely affect ESA-listed species and/or designated critical habitat.

You must include copies of the correspondence between yourself and the USFWS and/or NMFS in your SWPPP and this NOI. **[Basis statement content: A basis statement supporting the selection of this criterion should identify the federal action agency(ies) involved, the field office/regional office(s) providing that consultation, any tracking numbers of identifiers associated with that consultation (e.g., IPaC number, PCTS number), and the date the consultation was completed.]**

Provide a brief summary of the basis for criterion selection listed above [the necessary content for a supportive basis statement is provided under the criterion you selected.].

## IX. Historic Preservation

## X. Certification Information

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

|  |             |
|--|-------------|
| First Name, Middle Initial, Last Name: | <div></div> |
| Title:                                 | <div></div> |
| Signature:                             | <div></div> |
| Email:                                 | <div></div> |

Date:  /  /

**Notice of Intent for the 2017 NPDES Construction General Permit**

NPDES Form Date (2/17)

This Form Replaces Form 3510-9 (02/12)

Form Approved OMB No. 2040-0004

**Who Must File an NOI Form**

Under the provisions of the Clean Water Act, as amended (33 U.S.C. 1251 et. seq.; the Act), federal law prohibits stormwater discharges from certain construction activities to waters of the U.S. unless that discharge is covered under a National Pollutant Discharge Elimination System (NPDES) permit. Operators of construction sites where one or more acres are disturbed, smaller sites that are part of a larger common plan of development or sale where there is a cumulative disturbance of at least one acre, or any other site specifically designated by the Director, must obtain coverage under an NPDES general permit. For coverage under the 2017 CGP, each person, firm, public organization, or any other entity that meets either of the following criteria must file a Notice of Intent form: (1) they have operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or (2) they have day-to-day operational control of those activities at the project necessary to ensure compliance with the permit conditions. If you have questions about whether you need a NPDES stormwater permit, or if you need information to determine whether EPA or your state agency is the permitting authority, contact your EPA Regional Office.

**Completing the Form**

Obtain and read a copy of the 2017 CGP, viewable at <https://www.epa.gov/npdes/stormwater-discharges-construction-activities#cgp>. To complete this form, type or print uppercase letters, in the appropriate areas only. Please place each character between the marks (abbreviate if necessary to stay within the number of characters allowed for each item). Use one space for breaks between words, but not for punctuation marks unless they are needed to clarify your response. If you have any questions on this form, telephone EPA's NOI Processing Center at (866) 352-7755. **Please submit the original document with signature in ink - do not send a photocopied signature.**

**Section I. Approval to Use Paper NOI Form**

You must indicate whether you have been granted a waiver from electronic reporting from the EPA Regional Office. Note that you are not authorized to use this paper NOI form unless the EPA Regional Office has approved its use. Where you have obtained approval to use this form, indicate the waiver that you have been granted, the name of the EPA staff person who granted the waiver, and the date that approval was provided.

See <https://www.epa.gov/npdes/contact-us-stormwater#regional>

for a list of EPA Regional Office contacts.

**Section II. Permit Number**

Provide the master permit number of the permit under which you are applying for coverage (see Appendix B of the general permit for the list of eligible master permit numbers)

**Section III. Operator Information**

Provide the legal name of the person, firm, public organization, or any other entity that operates the project described in this NOI. Refer to Appendix A of the permit for the definition of "operator".

Indicate whether you are seeking coverage under this permit as a "federal operator" as defined in Appendix A.

Also provide a point of contact, the operator's mailing address, county, telephone number, and e-mail address (to be notified via e-mail of NOI approval when available). Correspondence for the NOI will be sent to this address.

If the NOI was prepared by someone other than the certifier (for example, if the NOI was prepared by the facility SWPPP contact or a consultant for the certifier's signature), include the full name, organization, phone number, and email address of the NOI preparer.

**Section IV. Project/Site Information**

Enter the official or legal name and complete street address, including city, state, ZIP code, and county or similar government subdivision of the project or site. If the project or site lacks a street address, indicate the general location of the site (e.g., Intersection of State Highways 61 and 34). Complete site information must be provided for permit coverage to be granted.

Provide the latitude and longitude of your facility in decimal degrees format. The latitude and longitude of your facility can be determined in several different ways, including through the use of global positioning system (GPS) receivers, U.S. Geological Survey (U.S.G.S.) topographic or quadrangle maps, and web-based siting tools, among others. For consistency, EPA requests that measurements be taken from the approximate center of the construction site. For linear construction sites, the measurement should be taken midpoint of the site. If known, enter the horizontal reference datum for your latitude and longitude. The horizontal reference datum is shown on the bottom left corner of USGS topographic maps; it is also available for GPS receivers.

Indicate whether the project is in Indian country lands or located on a property of religious or cultural significance to an Indian tribe, and if so, provide the name of the Indian tribe associated with the area of Indian country (including name of Indian reservation, if applicable), or if not in Indian country, provide the name of the Indian tribe associated with the property.

Enter the estimated construction start and completion dates using four digits for the year (i.e., 10/06/2012). Indicate to the nearest quarter acre the estimated area to be disturbed.

Indicate the type of construction site, if demolition is occurring, and if so, if the structure has at least 10,000 square feet of floor space. Indicate whether the pre-development land use of the site was used for agriculture Appendix A defines "agricultural land" as cropland, grassland, rangeland, pasture, and other agricultural land, on which agricultural and forest-related products or livestock are produced and resource concerns may be addressed. Agricultural lands include cropped woodland, marshes, incidental areas included in the agricultural operation, and other types of agricultural land used for the production of livestock.

Indicate whether earth-disturbing activities have already commenced on your project/site. If earth-disturbing activities have commenced on your site because stormwater discharges from the site have been previously covered under a NPDES permit, you must provide the 2012 CGP NPDES ID or the NPDES permit number if coverage was under an individual permit.

**Section V. Discharge Information**

You must confirm that you understand that the CGP only authorizes the allowable stormwater discharges listed in Part 1.2.1 and the allowable non-stormwater discharges listed in Part 1.2.2.



**Notice of Intent for the 2017 NPDES Construction General Permit**

NPDES Form Date (2/17)

This Form Replaces Form 3510-9 (02/12)

Form Approved OMB No. 2040-0004

Any discharges not expressly authorized under the CGP are not covered by the CGP or the permit shield provision of the CWA Section 402(k) and they cannot become authorized or shielded by disclosure to EPA, state, or local authorities via the NOI to be covered by the permit or by any other means (e.g., in the SWPPP or during an inspection). If any discharges requiring NPDES permit coverage other than the allowable stormwater and non-stormwater discharges listed in Parts 1.2.1 and 1.2.2 will be discharged, they must either be eliminated or covered under another NPDES permit.

Indicate whether discharges from the site will enter into a municipal separate storm sewer system (MS4), as defined in Appendix A.

Also, indicate whether any waters of the U.S. exist within 50 feet from your site. Note that if "yes", you are required to comply with the requirement in Part 2.2.1 of the permit to provide natural buffers or equivalent erosion and sediment controls.

For each unique point of discharge you list, you must specify the name of the first water of the U.S. that receives stormwater directly from the point of discharge and/or from the MS4 that the point of discharge discharges to. You must specify whether any waters of the U.S. that you discharge to are listed as "impaired" as defined in Appendix A, and the pollutants for which the water is impaired. You must identify any Total Maximum Daily Loads (TMDL) that have been completed for any of the waters of the U.S. that you discharge to.

Indicate whether discharges from the site will enter into a water of the U.S. that is designated as a Tier 2, Tier 2.5, or Tier 3 water. A list of Tier 2, 2.5, and 3 waters is provided as Appendix F. If the answer is "yes", name all waters designated as Tier 2, Tier 2.5, or Tier 3 to which the site will discharge.

**Section VI. Chemical Treatment Information**

Indicate whether the site will use polymers, flocculants, or other treatment chemicals. Indicate whether the site will employ cationic treatment chemicals. If the answer is "yes" to either question, indicate which chemical(s) you will use. Note that you are not eligible for coverage under this permit to use cationic treatment chemicals unless you notify your applicable EPA Regional Office in advance and the EPA office authorizes coverage under this permit after you have included appropriate controls and implementation procedures designed to ensure that your use of cationic treatment chemicals will not lead to a violation of water quality standards. If you have been authorized to use cationic treatment chemicals by your applicable EPA Regional Office, attach a copy of your authorization letter and include documentation of the appropriate controls and implementation procedures designed to ensure that your use of cationic treatment chemicals will not lead to a violation of water quality standards. Examples of cationic treatment chemicals include, but are not limited to, cationic polyacrylamide (C-PAM), PolyDADMAC (POLYDIALLYLDIMETHYLAMMONIUM CHLORIDE), and chitosan.

**Section VII. Stormwater Pollution Prevention Plan (SWPPP) Information**

All sites eligible for coverage under this permit are required to prepare a SWPPP in advance of filing the NOI, in accordance with Part 7. Indicate whether the SWPPP has been prepared in advance of filing the NOI.

Indicate the street, city, state, and ZIP code where the SWPPP can be found. Indicate the contact information (name, organization, phone, and email) for the person who developed the SWPPP for this project.

**Section VIII. Endangered Species Information**

Using the instructions in Appendix D, indicate under which criterion (i.e., A, B, C, D, E, or F) of the permit the applicant is eligible with regard to protection of ESA-listed endangered and threatened species and designated critical habitat. A description of the basis for the criterion selected must also be provided.

If criterion B is selected, provide the NPDES Number for the other operator who had previously certified their eligibility for the CGP under criterion A, C, D, E, or F. The Tracking Number was assigned when the operator received coverage under this permit, and is included in the notice of authorization.

If criterion C is selected, you must attach copies of your site map. See Part 7.2.4 of the permit for information about what is required to be in your site map. You must also specify the federally-listed species and/or federally-designated critical habitat that are located in the "action area" of the project, and provide the distance between the construction site and any listed endangered species and/or their designated critical habitat.

If criterion D, E, or F is selected, attach copies of any communications between you and the U.S. Fish and Wildlife Service and National Marine Fisheries Service and identify the participating agencies and Field Offices/Regional Offices you worked with in the basis statement of this NOI.

**Section IX. Historic Preservation**

Use the instructions in Appendix E to complete the questions on the NOI form regarding historic preservation.

**Section X. Certification Information**

The NOI must be signed as follows:

*For a corporation:* By a responsible corporate officer. For the purpose of this Section, a responsible corporate officer means:

(i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

*For a partnership or sole proprietorship:* By a general partner or the proprietor, respectively; or

*For a municipality, state, federal, or other public agency:* By either a principal executive officer or ranking elected official. For purposes of this Part, a principal executive officer of a federal agency includes (i) the chief executive officer of the agency, or

**Notice of Intent for the 2017 NPDES Construction General Permit**

NPDES Form Date (2/17)

This Form Replaces Form 3510-9 (02/12)

Form Approved OMB No. 2040-0004

(ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrator of EPA). Include the name and title of the person signing the form and the date of signing. An unsigned or undated NOI form will not be considered eligible for permit coverage.

**Modifying Your NOI**

**If you have been granted a waiver from your Regional Office from electronic reporting, and if after submitting your NOI you need to correct or update any fields on this NOI form, you may do so by indicating changes on this same form. Paperwork Reduction Act Notice**

Public reporting burden for this NOI is estimated to average 3.7 hours. This estimate includes time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. Send comments regarding the burden estimate, any other aspect of the collection of information, or suggestions for improving this form, including any suggestions which may increase or reduce this burden to: Chief, Information Policy Branch 2136, U.S. Environmental Protection, Agency, 1200 Pennsylvania Avenue, NW, Washington, D.C. 20460. Include the OMB control number on

any correspondence. Do not send the completed form to this address.

**Submitting Your Form**

Submit your NOI form by mail to one of the following addresses:

**For Regular U.S. Mail Delivery:**

Stormwater Notice Processing Center  
Mail Code 4203M, ATTN: 2017 CGP  
U.S. EPA  
1200 Pennsylvania Avenue, NW  
Washington, DC 20460

**For Overnight/Express Mail Delivery:**

Stormwater Notice Processing Center  
William Jefferson Clinton East Building - Room 7420  
ATTN: 2017 CGP  
U.S. EPA  
1201 Constitution Avenue, NW  
Washington, DC 20004

Visit this website for instructions on how to submit electronically:

<https://www.epa.gov/npdes/stormwater-discharges-construction-activities#ereporting>

### **Appendix K - Notice of Termination (NOT) Form and Instructions**

Part 8.3 requires you to use the NPDES eReporting Tool, or "NeT" system, to prepare and submit your NOT electronically. However, if you are given a waiver by the EPA Regional Office to use a paper NOT form, and you elect to use it, you must complete and submit the following form.



Submission of this Notice of Termination constitutes notice that the operator identified in Section III of this form is no longer authorized discharge pursuant to the NPDES Construction General Permit (CGP) from the site identified in Section IV of this form. All necessary information must be included on this form. Refer to the instructions at the end of this form.

**I. Approval to Use Paper NOT Form**

Have you been granted a waiver from electronic reporting from the Regional Office \*? ☐ YES ☐ NO

If yes, check which waiver you have been granted, the name of the EPA Regional Office staff person who granted the waiver, and the date of approval:

- Waiver granted: ☐ The owner/operator's headquarters is physically located in a geographic area (i.e., ZIP code or census tract) that is identified as under-served for broadband Internet access in the most recent report from the Federal Communications Commission.
- ☐ The owner/operator has issues regarding available computer access or computer capability.

Name of EPA staff person that granted the waiver:

Date approval obtained:

**\* Note: You must have been given approval by the Regional Office prior to using this paper NOT form. If you have not obtained a waiver, you must file this form electronically using the NPDES eReporting Tool (NeT).**

**II. Permit Information**

NPDES ID:

Reason for Termination (Check only one):

- ☐ You have completed all construction activities at your site, and you have met all other requirements in Part 8.2.1.
- ☐ Another operator has assumed control over all areas of the site and that operator has submitted an NOI and obtained coverage under the CGP.
- ☐ You have obtained coverage under an individual permit or another general NPDES permit addressing stormwater discharges from the construction site.

**III. Operator Information**

Operator Name:

Mailing Address:

Street:

City:  State:  ZIP Code:

County or Similar Government Division:

Phone:  -  -  Ext.

E-mail:

**IV. Project/Site Information**

Project/Site Name:

Project/Site Address:

Street/Location:

City:  State:  ZIP Code:

County or Similar Government Division:

## V. Certification Information

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

First Name, Middle Initial, Last Name:

[illegible]

Signature: \_\_\_\_\_ Date:   /   /   /   /   /   /

Email:

**Notice of Termination for the 2017 NPDES  
Construction General Permit**

NPDES Form Date (2/17)

This Form Replaces Form 3510-13 (02/12)

Form Approved OMB No. 2040-0004

**Who May File an NOT Form**

Permittees who are presently covered under the EPA-issued 2017 Construction General Permit (CGP) for Stormwater Discharges Associated with Construction Activity may submit an NOT form when: (1) earth-disturbing activities at the site are completed and the conditions in Parts 8.2.1.a through 8.2.1.b are met; or (2) the permittee has transferred all areas under its control to another operator, and that operator has submitted and obtained coverage under this permit; or (3) the permittee has obtained coverage under a different NPDES permit for the same discharges.

**Completing the Form**

Type or print, using uppercase letters, in the appropriate areas only. Please place each character between the marks. Abbreviate if necessary to stay within the number of characters allowed for each item. Use only one space for breaks between words, but not for punctuation marks unless they are needed to clarify your response. If you have any questions about this form, refer to <https://www.epa.gov/npdes/stormwater-discharges-construction-activities#cgp> or telephone EPA's NOI Processing Center at (866) 352-7755. Please submit original document with signature in ink - do not send a photocopied signature.

**Section I. Approval to Use Paper NOT Form**

You must indicate whether you have been granted a waiver from electronic reporting from the EPA Regional Office. Note that you are not authorized to use this paper NOT form unless the EPA Regional Office has approved its use. Where you have obtained approval to use this form, indicate the waiver that you have been granted, the name of the EPA staff person who granted the waiver, and the date that approval was provided.

See <https://www.epa.gov/npdes/contact-us-stormwater#regional> for a list of EPA Regional Office contacts.

**Section II. Permit Information**

Enter the existing NPDES ID assigned to the project. If you do not know the permit tracking number, or contact EPA's NOI Processing Center at (866) 352-7755.

Indicate your reason for submitting this Notice of Termination by checking the appropriate box. Check only one.

**Section III. Operator Information**

Provide the legal name of the person, firm, public organization, or any other entity that operates the project described in this NOT and is covered by the NPDES ID identified in Section II. Enter the complete mailing address, telephone number, and email address of the operator.

**Section IV. Project/Site Information**

Enter the official or legal name and complete street address, including city, state, ZIP code, and county or similar government subdivision of the project or site. If the project or site lacks a street address, indicate the general location of the site (e.g., Intersection of State Highways 61 and 34). Complete site information must be provided for termination of permit coverage to be valid.

**Section V. Certification Information**

The NOT, must be signed as follows:

*For a corporation:* By a responsible corporate officer. For the purpose of this Part, a responsible corporate officer means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing,

production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

*For a partnership or sole proprietorship:* By a general partner or the proprietor, respectively; or

*For a municipality, state, federal, or other public agency:* By either a principal executive officer or ranking elected official. For purposes of this Part, a principal executive officer of a federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrator of EPA).

Include the name, title, and email address of the person signing the form and the date of signing. An unsigned or undated NOT form will not be considered valid termination of permit coverage.

**Paperwork Reduction Act Notice**

Public reporting burden for this NOT is estimated to average 0.5 hours per notice, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. Send comments regarding the burden estimate, any other aspect of the collection of information, or suggestions for improving this form including any suggestions which may increase or reduce this burden to: Chief, Information Policy Branch, 2136, U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue, NW, Washington, DC 20460. Include the OMB number on any correspondence. Do not send the completed form to this address.

**Submitting Your Form:**

Submit your NOT form by mail to one of the following addresses:

**For Regular U.S. Mail Delivery:**

Stormwater Notice Processing Center  
Mail Code 4203M, ATTN: 2017 CGP  
U.S. EPA  
1200 Pennsylvania Avenue, NW  
Washington, DC 20460

**For Overnight/Express Mail Delivery:**

Stormwater Notice Processing Center  
William Jefferson Clinton East Building - Room 7420  
ATTN: 2017 CGP  
U.S. EPA  
1201 Constitution Avenue, NW  
Washington, DC 20004

Visit this website for instructions on how to submit electronically:

<https://www.epa.gov/npdes/stormwater-discharges-construction-activities#ereporting>

### **Appendix L – Suggested Format for Request for Chemical Treatment**

If you plan to add "cationic treatment chemicals" (as defined in Appendix A) to stormwater and/or authorized non-stormwater prior to discharge, Part 1.1.9 requires you to notify your applicable EPA Regional Office in advance of submitting your NOI. The EPA Regional Office will authorize coverage under this permit after you have included appropriate controls and implementation procedures designed to ensure that your use of cationic treatment chemicals will not lead to an exceedance of water quality standards. To notify your EPA Regional Office, you may use following form.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, DC 20460  
SUGGESTED FORMAT FOR NOTIFYING EPA ABOUT PROPOSED USE OF CATIONIC TREATMENT CHEMICALS  
UNDER THE 2017 NPDES CONSTRUCTION GENERAL PERMIT

Under Part 1.1.9 of the 2017 CGP, if you plan to add "cationic treatment chemicals" (as defined in Appendix A) to stormwater and/or authorized non-stormwater prior to discharge, you may not submit your Notice of Intent (NOI) until you notify your applicable EPA Regional Office in advance and the EPA Regional Office authorizes coverage under this permit after you have included appropriate controls and implementation procedures designed to ensure that your use of cationic treatment chemicals will not lead to a violation of water quality standards. You may use this suggested form to notify your EPA Regional Office about your proposed use of cationic treatment chemicals.

### I. Operator Information

Operator Name:

Mailing Address:

Street:

City:  State:  ZIP Code:  -

Phone:  -  -  Ext.

E-mail:

### II. Project/Site Information

Project/Site Name:

Project/Site Address:

Street/Location:

City:  State:  ZIP Code:  -

County or Similar Government Subdivision:

Site contact name (if different from operator):

Site contact phone (if different from operator):  -  -

Name(s) of receiving waterbodies:

### III. Map

Attach a map that illustrates the entire site including all of the below items. Include this map in your Stormwater Pollution Prevention Plan (SWPPP):

- All receiving waterbodies
- All proposed location(s) of chemical treatment system(s)
- All proposed point(s) of discharge to receiving waterbodies
- All soil types within areas to be disturbed
- All area of earth disturbance
- Sufficient indication of topography to indicate where stormwater flows

Attach a schematic drawing of the proposed treatment system(s). Include all components of the treatment train, sample points, and pipe configurations. In addition to sufficient holding capacity upstream of treatment, the system must have the capacity to hold water for testing and to re-treat water that does not meet water quality standards.



#### IV. Responsible Personnel

Treatment System Operator or Company Name (if subcontracted out):

Street/Location:

City: 



 State: 



 Zip Code: 



 -

Responsible personnel. List personnel who will be responsible for operating the chemical treatment systems and application of the chemicals. Cite the training that the personnel have received in operation and maintenance of the treatment system(s) and use of the specific chemical(s) proposed.

#### V. Proposed Treatment

Check proposed treatment system.

- ☐ Chitosan enhanced sand filtration with discharge to infiltration (ground water)
- ☐ Chitosan enhanced sand filtration with discharge to temporary holding ponds (batch).
- ☐ Chitosan enhanced sand filtration with discharge to surface waters (flow-through).
- ☐ Other (describe below and submit documentation that the proposed system and chemical(s) demonstrate the ability to remove turbidity and produce non-toxic effluent/ discharge)

Check proposed cationic chemical(s) to be used:

- ☐ FloccClear™ (2% chitosan acetate solution)
- ☐ StormKlear™ LiquiFloc™ (1% chitosan acetate solution).
- ☐ ChitoVan™ (1% chitosan acetate solution).
- ☐ StormKlear™ LiquiFloc™ (3% Chitosan acetate solution)
- ☐ Other \_\_\_\_\_

Estimated Treatment Period Start Date: 



 / 



 /

Estimated Treatment Period End Date: 



 / 



 /

Describe sampling and recordkeeping schedule. Attach additional sheets as needed:

Explain why you have selected this proposed treatment system and chemicals. Include an explanation of why the use of cationic treatment chemicals is necessary at the site. Reference how the soil types on your site influenced your choices. Describe or provide an illustration of how the site of the discharge will be stabilized and why the discharge location will not cause erosion of the discharge water's bank or bed (please note that a permit from the Corps and state agencies may be necessary to place rock in the water body for this stabilization). Attach as many additional sheets as needed for a full explanation. If you have a report from a chemical treatment contractor describing their recommended approach you may attach that.

|                               |
|-------------------------------|
| VI. Certification Information |
|-------------------------------|

I have documented and hereby certify that the following information is correct and has been documented in the SWPPP for this project:

- The SWPPP includes a complete site-specific description of the chemical treatment system herein proposed for use, including specifications, design, and Material Safety Data Sheets for all chemicals to be used.
- The controls to be used on the site are compatible with the safe and effective use of cationic chemical treatment.
- I verified through jar tests that the site soil is conducive to chemical treatment.
- I verified that the chemical treatment system operators for this project received training.
- I read, understand, and will follow all conditions and design criteria in the applicable use designation(s).
- If the discharge is to tribal waters, I notified the appropriate tribal government of the intent to use chemical treatment on a site located within that jurisdiction.
- I will keep the use level designation, operation and maintenance manual, and training certificate on site prior to and during use of chemical treatment.
- A licensed engineer designed the system for this project including system sizing, pond sizing, and flow requirements.
- I verify that the discharge will not adversely affect downstream conveyance systems or stream channels (e.g. cause erosion).

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

[illegible][illegible][illegible]

Signature: \_\_\_\_\_

Date: | | / | | / | | | |

Email:

**Instructions for Submitting This Form:**

Submit your this form to your applicable EPA Regional Office. Contact information can be found at:

<https://www.epa.gov/npdes/contact-us-stormwater#regional>

**Attachment C – NOI and EPA Authorization e-mail**

**Attachment D – Inspection Form**

**Attachment E – Corrective Action Form**

**Attachment F – SWPPP Amendment Log**

[illegible]

**Attachment G –Subcontractor Certifications/Agreements**



SUBCONTRACTOR CERTIFICATION  
STORMWATER POLLUTION PREVENTION PLAN

Project Number: \_\_\_\_\_

Project Title: \_\_\_\_\_

Operator(s): \_\_\_\_\_

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform onsite. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

**I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the practices described in the SWPPP.**

This certification is hereby signed in reference to the above named project:

Company: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Type of construction service to be provided: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

**Attachment H – Grading and Stabilization Activities Log**

[illegible]

**Attachment I – SWPPP Training Log**

### Stormwater Pollution Prevention Training Log

Project Name:

Project Location:

Instructor's Name(s):

Instructor's Title(s):

Course Location: \_\_\_\_\_ Date: \_\_\_\_\_

Course Length (hours): \_\_\_\_\_

Stormwater Training Topic: *(check as appropriate)*

- |   |  |
|---|--|
| <input type="checkbox"/> <b>Sediment and Erosion Controls</b> | <input type="checkbox"/> <b>Emergency Procedures</b>           |
| <input type="checkbox"/> <b>Stabilization Controls</b>        | <input type="checkbox"/> <b>Inspections/Corrective Actions</b> |
| <input type="checkbox"/> <b>Pollution Prevention Measures</b> |  |

Specific Training Objective: \_\_\_\_\_

Attendee Roster: *(attach additional pages as necessary)*

| No. | Name of Attendee | Company |
|-----|------------------|---------|
| 1   |                  |         |
| 2   |                  |         |
| 3   |                  |         |
| 4   |                  |         |
| 5   |                  |         |
| 6   |                  |         |
| 7   |                  |         |
| 8   |                  |         |

**Attachment J – Delegation of Authority Form**

### Delegation of Authority

I, \_\_\_\_\_ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the \_\_\_\_\_ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

\_\_\_\_\_ (name of person or position)  
\_\_\_\_\_ (company)  
\_\_\_\_\_ (address)  
\_\_\_\_\_ (city, state, zip)  
\_\_\_\_\_ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix I of EPA's Construction General Permit (CGP), and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix I.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

**Name:** \_\_\_\_\_

**Company:** \_\_\_\_\_

**Title:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Attachment K – Endangered Species Documentation**



**Attachment L – Historic Preservation Documentation**

### Attachment M – Rainfall Gauge Recording

Use the table below to record the rainfall gauge readings at the beginning and end of each work day. An example table follows.

| Month/Year |            |          | Month/Year |            |          | Month/Year |            |          |
|------------|------------|----------|------------|------------|----------|------------|------------|----------|
| Day        | Start time | End time | Day        | Start time | End time | Day        | Start time | End time |
| 1          |            |          | 1          |            |          | 1          |            |          |
| 2          |            |          | 2          |            |          | 2          |            |          |
| 3          |            |          | 3          |            |          | 3          |            |          |
| 4          |            |          | 4          |            |          | 4          |            |          |
| 5          |            |          | 5          |            |          | 5          |            |          |
| 6          |            |          | 6          |            |          | 6          |            |          |
| 7          |            |          | 7          |            |          | 7          |            |          |
| 8          |            |          | 8          |            |          | 8          |            |          |
| 9          |            |          | 9          |            |          | 9          |            |          |
| 10         |            |          | 10         |            |          | 10         |            |          |
| 11         |            |          | 11         |            |          | 11         |            |          |
| 12         |            |          | 12         |            |          | 12         |            |          |
| 13         |            |          | 13         |            |          | 13         |            |          |
| 14         |            |          | 14         |            |          | 14         |            |          |
| 15         |            |          | 15         |            |          | 15         |            |          |
| 16         |            |          | 16         |            |          | 16         |            |          |
| 17         |            |          | 17         |            |          | 17         |            |          |
| 18         |            |          | 18         |            |          | 18         |            |          |
| 19         |            |          | 19         |            |          | 19         |            |          |
| 20         |            |          | 20         |            |          | 20         |            |          |
| 21         |            |          | 21         |            |          | 21         |            |          |
| 22         |            |          | 22         |            |          | 22         |            |          |
| 23         |            |          | 23         |            |          | 23         |            |          |
| 24         |            |          | 24         |            |          | 24         |            |          |
| 25         |            |          | 25         |            |          | 25         |            |          |
| 26         |            |          | 26         |            |          | 26         |            |          |
| 27         |            |          | 27         |            |          | 27         |            |          |
| 28         |            |          | 28         |            |          | 28         |            |          |
| 29         |            |          | 29         |            |          | 29         |            |          |
| 30         |            |          | 30         |            |          | 30         |            |          |
| 31         |            |          | 31         |            |          | 31         |            |          |

**Attachment N – Order of Conditions**

**DO NOT REMOVE  
THIS PAGE INTENTIONALLY LEFT BLANK**