CITY OF WORCESTER MASSACHUSETTS



PROJECT MANUAL REGIONAL EMERGENCY COOMUNICATIONS CENTER 2 COPPAGE DRIVE, WORCESTER MA 01603

DIVISIONS 0 THROUGH 31

DECEMBER 11, 2014

CLARK C. BURRITT PRINCIPAL ARCHITECT DEPARTMENT OF PUBLIC WORKS AND PARKS 50 SKYLINE DRIVE WORCESTER, MA 01605 SET NUMBER

PROJECT

REGIONAL EMERGENCY COMMUNICATIONE CENTER 2 COPPAGE DRIVE WORCESTER, MA 01603

Owner

CITY OF WORCESTER EXECUTIVE OFFICE OF THE CITY MANAGER WORCSETER CITY HALL, 455 MAIN STREET WORCESTER, MA 01608

DEPARTMENT OF PUBLIC WORKS AND PARKS 20 EAST WORCESTER STREET WORCESTER, MA 01605

PAUL MOOSEY, P.E COMMISSIONER DEPARTMENT OF PUBLIC WORKS & PARKS CONTRACTING OFFICER



CLARK C. BURRITT PRINCIPAL ARCHITECT

DEPARTMENT OF PUBLIC WORKS AND PARKS ARCHITECTURAL DIVISION 50 SKYLINE DRIVE WORCESTER MA 01605 PHONE: (508) 799-8588 FAX: (508) 799-8188

TABLE OF CONTENTS

PART ONE – PROJECT MANUAL

DIVISION 0 – CONTRACTUAL REQUIREMENTS

| SECTION 001000 | INVITATION TO BID/NOTICE TO CONTRACTORS |
|----------------|---|
| SECTION 001500 | INSTRUCTIONS TO BIDDERS |
| SECTION 002000 | GENERAL CONDITIONS |
| SECTION 003000 | SUPPLEMENTARY GENERAL CONDITIONS |
| SECTION 004000 | FORM FOR GENERAL BID |
| SECTION 005000 | FORM FOR SUB-BID |
| SECTION 006000 | OWNER-CONTRACTOR AGREEMENT |
| SECTION 007000 | FORM OF SUB-CONTRACT |
| SECTION 008000 | PREVAILING WAGE RATES |
| SECTION 008500 | TAX PAYMENT CERTIFICATE |
| SECTION 009500 | RESPONSIBLE EMPLOYER ORDINANCE |
| | |

DIVISION 1 – GENERAL REQUIREMENTS

| SECTION 010100 | SUMMARY |
|----------------|-------------------------------------|
| SECTION 010450 | CUTTING AND PATCHING |
| SECTION 010500 | FIELD ENGINEERING |
| SECTION 012000 | PROJECT MEETINGS |
| SECTION 012200 | UNIT PRICES |
| SECTION 012300 | ALTERNATES |
| SECTION 012500 | SUBSTITUTION PROCEDURES |
| SECTION 012600 | CONTRACT MODIFICATION PROCEDURES |
| SECTION 012900 | PAYMENT PROCEDURES |
| SECTION 013100 | PROJECT MANAGEMENT AND COORDINATION |
| SECTION 013300 | SUBMITTAL PROCEDURES |
| SECTION 014000 | QUALITY REQUIREMENTS |
| SECTION 014200 | REFERENCES |
| SECTION 015000 | TEMPORARY FACILITIES AND CONTROLS |
| SECTION 016000 | PRODUCT REQUIREMENTS |
| SECTION 017400 | WARRANTIES AND BONDS |
| SECTION 017700 | CLOSEOUT PROCEDURES |
| | |

DIVISION 2 – SITEWORK

SECTION 024119 SELECTIVE DEMOLITION

DIVISION 3 – CONCRETE

| SECTION 033000 | CAST-IN-PLACE CONCRETE |
|----------------|-----------------------------|
| SECTION 033543 | POLISHED CONCRETE FINISHING |

DIVISION 4 – MASONRY (NO SECTIONS)

DIVISION 5 – METALS

*** SECTION 055000 METAL FABRICATIONS

DIVISION 6 - WOOD AND PLASTICS (NO SECTIONS)

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

*** SECTION 071416 COLD FLUID-APPLIED WATERPROOFING

DIVISION 8 – DOORS AND WINDOWS

| | SECTION 081213 | HOLLOW METAL FRAMES |
|-----|-----------------------|-------------------------------|
| | SECTION 081416 | FLUSH WOOD DOORS |
| | SECTION 084413 | GLAZED ALUMINUM CURTAIN WALLS |
| *** | SECTION 088000 | GLAZING |

DIVISION 9 – FINISHES

| | SECTION 092900 | GYPSUM BOARD SYSTEMS |
|-----|-----------------------|---------------------------------------|
| *** | SECTION 095113 | ACOUSTICAL PANEL CEILINGS |
| | SECTION 096513 | RESILIENT BASE AND ACCESSORIES |
| | SECTION 096723 | RESINOUS FLOORING |
| *** | SECTION 099100 | PAINTING |

DIVISION 10 – SPECIALTIES

| SECTION 102113 | PLASTIC TOILET COMPARTMENTS |
|----------------|-----------------------------|
| SECTION 102800 | TOILET AND BATH ACCESSORIES |
| SECTION 105113 | METAL LOCKERS |

DIVISION 12 – FURNISHINGS

| SECTION 122413 | ROLLER WINDOW SHADES |
|----------------|----------------------|
| SECTION 123530 | RESIDENTIAL CASEWORK |

DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 133419 METAL BUILDING SYSTEMS

DIVISION 14 – CONVEYING SYSTEMS (NO SECTIONS)

DIVISION 21-FIRE PROTECTION

*** SECTION 210000 FIRE PROTECTION
 DIVISION 22-PLUMBING
 *** SECTION 220000 PLUMBING

DIVISION 23 – MECHANICAL

*** SECTION 230000 HEATING, VENTILATION, AND AIR CONDITIONING

DIVISION 23 – ELECTRICAL

*** SECTIOIN 260000 ELECTRICAL

DIVISION 31 – EARTHWORK

| SECTION 310000 | EARTHWORK |
|-----------------------|-------------|
| SECTION 316216 | STEEL PILES |

APPENDICES

APPRENDIX 1 – Hazardous Building Materials Report

APPRENDIX 2 – Geotechnical Summary Report

APPRENDIX 3 – ASTME F2170 Rapid RH Test Results

APPRENDIX 4 – Report of Vapor Emission & Alkalinity Test (ASTM F1869)

PART TWO – DRAWINGS

PROJECT DRAWING LIST

T1.0 TITLE SHEET

CIVIL

- C1 EXISTING CONDITIONS
- C2 DEMOLITION PLAN
- C3 EROSION AND SEDIMENT CONTROL
- C4.1 SITE PLAN (BASE PLAN)
- C4.2 SITE PLAN (ALTERNATES)
- C5 DRAINAGE AND UTILITIES
- C6 DETAILS

ARCHITECTURAL

- D1.0 DEMOLITION PLAN-EXISTING PLAN & ELEVATIONS
- A1.0 EXISTING FOUNDATION WORK PLAN & DETAILS
- A1.1 FLOOR PLAN & DETAILS
- A1.2 FIRST FLOOR PLAN ENLARGED
- A1.3 ROOF PLAN & DETAILS
- A1.4 COVERED TRAILER STORAGE
- A2.1 ELEVATIONS
- A3.1 BUILDING SECTIONS
- A4.1 WALL SECTIONS
- A4.2 WALL SECTIONS
- A5.1 SECTION DETAILS
- A6.1 INTERIOR ELEVATIONS

- A6.2. INTERIOR ELEVATIONS
- A6.3 INTERIOR ELEVATIONS
- A7.1 REFLECTED CEILING PLANS
- A8.1 SCHEDULES & DETAILS

FIRE PROTECTION

- FP0.1 FIRE PROTECTION LEGEND, NOTES & DETAILS
- FP0.2 FIRE PROTECTION DETAILS
- FP2.0 FIRE PROTECTION DEMOLITION PLAN
- FP3.1 FIRE PROTECTION FLOOR PLANS

PLUMBING

- P0.1 PLUMBING LEGEND, NOTES & SCHEDULLES
- P0.2 PLUMBING DETAILS
- P2.0 PLUMBING DEMOLITION PLAN
- P3.1 PLUMBING FLOOR PLANS
- P3.2 PLUMBING FLOOR PLANS

HVAC

- H0.1 HVAC LEGEND & GENERAL NOTES
- H0.2 HVAC LEGEND & GENERAL NOTES
- H0.3 HVAC SCHEDULES
- H0.4 HVAC DETAILS
- H0.5 HVAC DETAILS
- H0.6 HVAC CONTROLS
- H1.1 HVAC DEMOLITION PLAN
- H2.1 HVAC LEVEL 1 FLOOR PLAN
- H2.2 HVAC ROOF PLAN

ELECTRICAL

- E0.1 ELECTRICAL LEGEND AND NOTES
- E0.2 ELECTRICAL SYSTEMS RISER DIAGRAMS
- E0.3 ELECTRICAL SYSTEMS RISER DIAGRAMS
- E0.4 ELECTRICAL SCHEDULES
- E0.5 ELECTRICAL DETAILS
- E0.6 ELECTRICAL DETAILS
- E1.0 ELECTRICAL SITE PLAN
- E2.0 FIRST FLOOR PLAN ELECTRICAL DEMOLITION
- E3.0 FIRST FLOOR PLAN LIGHTING PLAN
- E3.1 FIRST FLOOR PLAN ELECTRICAL POWER PLAN
- E3.2 FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART PLAN
- E3.3 FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART PLAN
- E3.4 FIRST FLOOR PLAN ELECTRICAL FIRE ALARM PLAN
- E3.5 FIRST FLOOR PLAN ELECTRICAL SECURITY PLAN
- E3.6 ROOF ELECTRICAL PLAN
- E3.7 ROOF ELECTRICAL LIGHTING PROTECTION PLAN

END OF TABLE OF CONTENTS



CITY OF WORCESTER INVITATION TO BID / NOTICE TO CONTRACTORS REGIONAL EMERGENCY COMMUNICATIONS CENTER 2 COPPAGE DRIVE

Worcester, Massachusetts 01603

The City of Worcester, the Awarding Authority, invites sealed bids for: **REGIONAL EMERGENCY COMMUNICATIONS CENTER, 2 Coppage Drive, Worcester, Massachusetts 01603** in accordance with documents prepared by Clark C. Burritt, Principal Architect, Department of Public Works & Parks, Architectural Services Division, 50 Skyline Drive, Worcester, MA 01605.

The project scope generally includes construction of steel building and interior buildout consisting of plumbing, HVAC, fire protection and electrical and any other related work necessary to complete all of the Work of the respective Sections and indicated on the drawings.

SEALED GENERAL BIDS for **REGIONAL EMERGENCY COMMUNICATIONS CENTER** will be received at the Department of Public Works and Parks, Architectural Services Division, 50 Skyline

Drive, Worcester, MA 01605 no later than 11:00 a.m., Tuesday, January 13, 2015 and will be publicly opened thereafter and read aloud.

General Bids must be accompanied by:

- (1) A fully executed FORM FOR THE GENERAL BID; Specification Section 00400.
- (2) Certification of Payment of Massachusetts State Taxes Form; Specification Section 00850.
- (3) Affidavit of Acknowledgment and Certificate of Compliance for the City of Worcester Minority/Women Business Enterprise & Worker Utilization. M/WBEP-Form EOO-101; Specification Section 00950.
- Initial Statement and Certification of Compliance with the Responsible Employer Ordinance, Form REO-101 page 2.
 Specification Section 00950.
- (5) **Provide Evidence** of Compliance with the Responsible Employer Ordinance (**REO**). As per Specification Section 00950.
- (6) A Certificate of Eligibility certifying the bidder's qualification in the category of *GENERAL BUILDING CONSTRUCTION* issued by the Division of Capital Asset Management, DCAM (formerly the Division of Capital Planning and Operations, DCPO), showing that the Bidder has been approved to bid on projects the size and nature of this project. In order to be eligible to be awarded this contract, a general bidder must be certified in the appropriate category and for the total Project Cost including all alternates elected (if applicable) to be taken by the Owner.
- (7) A Contractor Update Statement, DCPO FORM CQ3. It is the Bidder's responsibility to obtain the necessary forms and make application to DCAM (DCPO) in sufficient time for DCAM (DCPO) to evaluate the application and issue a Certificate of Eligibility. A sample of the

Contractor Update Statement, DCAM FORM CQ3 (revised December, 1999) is located at the end of Section 001500.

- (8) Bid deposit for the general bid in the amount of **five** (5) **percent** of the value of the bid, or a bid bond.
- (9) **Foreign Corporation Certificate of Registration** from the Commonwealth of Massachusetts State Secretary (if applicable).

SEALED FILED SUB-BIDS for **REGIONAL EMERGENCY COMMUNICATIONS CENTER** will be received at the Department of Public Works and Parks, Architectural Services Division, 50 Skyline Drive, Worcester, MA 01605 no later than 11:00 a.m., Tuesday, December 30, 2014 and will be publicly opened thereafter and read aloud.

Filed Sub-Bids required are as follows:

- (1) Section 055000 METAL FABRICATIONS
- (2) Section 071113 WATERPROOFING, DAMPROOFING & CAULKING
- (3) Section 088000 GLASS AND GLAZING
- (4) Section 095113 ACOUSTICAL CEILING TILES
- (5) Section 099123 INTERIOR PAINTING
- (6) Section 210000 FIRE PROTECTION
- (7) Section 220000 PLUMBING
- (8) Section 230000 HVAC
- (9) Section 260000 ELECTRICAL

SUB-BIDS must be accompanied by:

- (1) A fully executed FORM FOR SUB-BID; **Specification Section 00500**.
- (2) Certification of Payment of Massachusetts State Taxes Form; **Specification Section 00850**.
- (3) Affidavit of Acknowledgment and Certificate of Compliance for the City of Worcester Minority/Women Business Enterprise & Worker Utilization. M/WBEP-Form EOO-101; Specification Section 00900.
- (4) **Initial Statement and Certification of Compliance** with the Responsible Employer Ordinance, **Form REO-101 page 2, Specification Section 00950**.
- (5) **Provide Evidence** of Compliance with the Responsible Employer Ordinance (**REO**). As per Specification Section 00950.
- (6) A Certificate of Eligibility certifying the bidders qualification, in the respective filed sub trade category being bid, issued by the Division of Capital Asset Management, DCAM (formerly the Division of Capital Planning and Operations, DCPO), showing that the Bidder has been approved to bid on projects the size and nature of this project. In order to be eligible to be awarded this contract, a bidder must be certified in the appropriate category and for the total Cost of the respective work including all alternates elected (if applicable) to be taken by the Owner.
- (7) A Contractor Update Statement, DCPO FORM CQ3. It is the Bidder's responsibility to obtain the necessary forms and make application to DCAM (DCPO) in sufficient time for DCAM (DCPO) to evaluate the application and issue a Certificate of Eligibility. A sample of the Contractor Update Statement, DCAM FORM CQ3 (revised December, 1999) is located at the end of Section 00150.

- (8) Bid deposit for the sub-bid in the amount of **five** (5) **percent** of the value of the bid, or a bid bond.
- (9) **Foreign Corporation Certificate of Registration** from the Commonwealth of Massachusetts State Secretary (if applicable).

Plans and Specifications will be available Thursday, December 11, 2014at the Department of Public Works and Parks, Architectural Services, 50 Skyline Drive, Worcester, MA 01605, Phone: (508) 799-8588, Fax: (508) 799-8188. Plans and specifications are also available at <u>http://bids.worcesterma.gov/</u>.

- (1) A refundable plan deposit in the form of a company check (cash not accepted), without date restrictions, payable to "City of Worcester" in the amount of \$50.00 per set for up to three (3) sets is required. If additional sets are required, a separate non-refundable check in the amount of \$50.00 per set is required. Deposits for up to three (3) sets shall be returned to the bidders who return the complete sets, including any addenda issued, in good condition to the Department of Public Works and Parks, Architectural Services, 50 Skyline Drive, Worcester, MA 01605 within thirty (30) days after the bid opening.
- (2) If **plans** and **specifications** are requested to be mailed, a <u>separate</u> non-refundable shipping and handling/mailing fee in the form of a company check payable to "City of Worcester" in the amount of \$50.00 is required per set.
- (3) A "Contractor's Plans and Specifications Request Form" is required to be filled out to obtain **plans** and **specifications** via the Architectural Services Division. Forms are available at the Department of Public Works and Parks, Architectural Services, 50 Skyline Drive, Worcester, MA 01605, Phone: (508) 799-8588, Fax: (508) 799-8188.
 - (a) After receipt of Contractor's Plans and Specifications Request Form, deposit and mailing fee, plans and specifications will be shipped via UPS.

(4) PARTIAL SETS **WILL NOT** BE ISSUED OR MAILED.

Contract Documents may be viewed, but not removed, at the following locations:

Architectural Services Department of Public Works and Parks 50 Skyline Drive Worcester, MA 01605

WAGE RATES - Bids are subject to the provisions of M.G.L., Chapter 149, Section 44A to J inclusive, as amended to date, and such other Federal, State and Municipal laws or regulations.

Attention of bidders is particularly called to the requirements as to conditions of employment to be observed and to the fact that not less than the minimum wage rates set forth in the Contract Documents shall be paid on this project. Minimum wage rates are per M.G.L., Chapter 149, Sections 26 & 27 inclusive.

<u>MINORITY/WOMEN BUSINESS ENTERPRISE PROGRAM</u> - The City of Worcester has established goals for the participation of minorities and women workers, contractors, subcontractors, and suppliers on all City projects. Bids must demonstrate the contractor's ability to utilize minorities and women in all phases of this project. The City of Worcester has established a program to enhance contract opportunities to minority and women-owned businesses through its Minority/Women Business Enterprise Program. This program contains minimum participation goals of ten (10) percent by MBE's and five (5) percent by WBE's calculated as a percentage of the total bid price. Accordingly, <u>all general bidders and filed sub-bidders must execute and submit with their respective bids M/WBEP Form EOO-101, Contractor's and Filed Subcontractor's Certification.</u>

<u>RESPONSIBLE EMPLOYER ORDINANCE</u> - The performance of the work derived from this bid is subject to the City's Responsible Employer Ordinance, Chapter 2, Section 35 of WRO (2008). Accordingly, <u>all general bidders and filed sub-bidders must execute and submit with their respective bids</u> **Form REO-101 page 2**, Contractor's and Filed Subcontractor's Initial Certification.

<u>NOISE ORDINANCE</u> – All Contractors must adhere to the provision of § 1A(e)(9) of chapter nine of the Revised Ordinances of the city by limiting their on-site, noise producing construction and related work to the hours specified by said ordinance.

PRE-BID CONFERENCE - The pre-bid conference will be held on Monday, December 22, 2014 at the project site, 2 Coppage Drive, Worcester, 01603 beginning at 10:00 a.m. with a brief overview and tour of the construction areas. It is recommended that all Bidders attend this meeting.

WORK UNDER SEPARATE CONTRACTS AND BY OWNER – The Owner may do other work during construction with its own forces or by separate contract.

<u>COMMENCEMENT OF WORK AND TIME OF COMPLETION</u> – The selected General Bidder must agree to commence work within five (5) days of the execution of a General Contract and to substantially complete on October 13, 2015 in accordance with the project schedule set forth in the contract documents.

The Awarding Authority reserves the right to waive any informality in, or to reject any or all general bids, if it were in the public interest to do so. In inviting sub-bids in connection with such a contract, the Awarding Authority shall reserve the right to reject any sub-bid on any sub-trade, if it determines that such sub-bid does not represent the sub-bid of a person competent to perform the work as specified, or that less than three (3) such sub-bids were received and that the prices are not reasonable for acceptance without further competition.

The City of Worcester is an equal opportunity/affirmative action employer.

City of Worcester, Massachusetts Executive Office of the City Manager

END OF DOCUMENT



CITY OF WORCESTER INSTRUCTIONS TO BIDDERS

SECTION 1 - INTRODUCTION; DEFINITIONS

In accordance with an Advertisement for Bids, a copy of which is bound herewith, the City of Worcester (the "Owner") has invited bids for the Regional Emergency Communications Center. The project consists of construction of steel building and interior buildout consisting of plumbing, HVAC, fire protection and electrical and any other related work necessary to complete all of the Work of the respective Sections and indicated on the drawings.

- 1.1 These Instructions to bidders (the "Instructions") are intended to assist bidders (which term as used in these Instructions shall include general bidders and subbidders if applicable) in the preparation of their bids, to call attention to various legal requirements and to set forth certain conditions upon which bids are submitted and received.
- 1.2 The award of the contract is governed by Chapter 149, Sections 44A-44J of the Massachusetts General Laws. Certain provisions of the foregoing statute and of other applicable statutes are summarized in these Instructions. Whenever these Instructions or any other contract documents set forth or summarize applicable statutory provisions, whether or not the statutes have been specifically referred to, such summaries are for convenience only, do not purport to be complete or correct as summaries of any particular material, and shall in no respect supersede, expand or limit rights or duties of the Owner or bidders in matters governed by the statute.
- 1.3 The following definitions shall apply in these Instructions and in the other Contract Documents:
 - (1) The term "bidding documents" shall include the Advertisement for Bids, these Instructions, the bid forms, contract forms and other Contract Documents bound herewith, the Drawings, the Specifications, and all Addenda issued prior to receipt of bids.
 - (2) The terms "Addenda" and "Addendum" shall mean written documents and/or drawings issued by the Owner prior to execution of the contract, which supplement, modify, correct, explain or interpret the bidding documents.
 - (3) All definitions set forth in the Conditions of the Contract or the other Contract Documents as therein defined are applicable to these Instructions and to the other bidding documents.

SECTION 2 - AVAILABILITY OF CONTRACT DOCUMENTS

- 2.1 Each person requesting Contract Documents including bid forms, plans, specifications and addenda, shall proceed as directed in the Advertisement for Bids. Bidders may obtain up to three (3) sets of the Contract Documents upon payment of a fully refundable deposit of fifty (\$50.00) dollars per set as provided in the Advertisement for Bids. Additional sets may be obtained at the cost of reproduction and no provisions for a refund shall apply. Deposits will be refunded to all persons returning Contract Documents to the office of the Owner in good condition within thirty (30) days after the date for opening of the general bid, otherwise deposits shall be retained by the Owner.Plans and specifications may also be available at <u>http://bids.worcesterma.gov/</u>.
- 2.2 The Owner shall prepare and update daily a list of persons who have requested a set of drawings and specifications for the project, which list shall be sent each week to the Central Register published by the Massachusetts Secretary of State.

SECTION 3 - EXAMINATION OF SITE AND CONTRACT DOCUMENTS; PRE-BID CONFERENCE

- 3.1 Before submitting a bid, each bidder must: (a) thoroughly examine the Contract Documents (b) visit the site to fully examine and acquaint himself with local conditions that may in any manner affect cost, progress or performance of the Work, (c) familiarize himself with federal, state and local laws, ordinances, rules and regulations that may in any manner affect cost, progress or performance of the Work, and (d) study and carefully correlate his observations with the requirements of the Contract Documents. Failure of a bidder to visit the site and acquaint himself with the Contract Documents or to attend the pre-bid conference, if any, shall in no way relieve the bidder from any obligation with respect to his bid.
- 3.2 On request, the Owner will provide each bidder access to the site to conduct such reasonable investigations and tests as such bidder deems necessary to prepare his bid.
- 3.3 Each bidder shall promptly notify Jeremy C. Flansburg, Project Manager, City of Worcester, Department of Public Works and Parks, Architectural Services, 50 Skyline Drive, Worcester, MA 01605 of any ambiguity, inconsistency, or error he may discover upon examination of the Contract Documents, the site or other local conditions. The submission of a bid will constitute a representation by the bidder that he has complied with every requirement of this Section 3 and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the work of this contract.
- 3.4 A pre-bid conference will be held at the place and time set forth in the Advertisement for Bids.

SECTION 4 - ADDENDA AND INTERPRETATION OF CONTRACT DOCUMENTS

- 4.1 All questions and requests for clarifications or interpretations of the meaning of the Contract Documents shall be in writing, or Facsimile Telephone Transmission (FAX), addressed to Jeremy C. Flansburg, Project Manager, City of Worcester, Department of Public Works and Parks, Architectural Services, 50 Skyline Drive, Worcester, MA 01605, phone: (508) 799-8588, fax (508) 799-8188, email: <u>flansburgj@worcesterma.gov</u> and to be given consideration must be received at least five (5) days prior to the date fixed for opening of bids.
- 4.2 Clarifications or such interpretations and any supplemental instructions or forms, if issued, will be issued in the form of written Addenda and when possible, not later than two (2) days before the date fixed for opening of bids. Addenda will be sent by certified mail, or by U.S. Postal Service "Express Mail" next day delivery service, or similar express delivery service, with return receipt requested, or by Facsimile Telephone Transmission (FAX) to the number listed on the receipt for drawings and specifications, followed by a hard copy sent by regular mail to all parties who, according to the Owner's records, have obtained or requested plans and specifications and have furnished to the Owner a street address and/or a post office box number for such purpose. Each bidder shall be responsible for determining that he has received all Addenda issued, and failure of any bidder to receive any such Addendum shall not relieve such bidder from any obligation under its bid as submitted. Failure to acknowledge receipt of an Addendum on the Bid Form by the Bidder may be cause for rejection of the Bid.
- 4.3 All Addenda so issued shall become part of the Contract Documents.
- 4.4 Oral clarifications or interpretations will be of no legal effect. The Owner will not be responsible for, and no bidder may rely upon or use as the basis of a claim against the Owner or the Architect, any information, explanation or interpretation of the Contract Documents rendered in any fashion except as herein provided.

SECTION 5 - PRE QUALIFICATION BY DIVISION OF CAPITAL ASSET MANAGEMENT (DCAM formerly DCPO) (CHAPTER 149 PROJECTS)

- 5.1 **GENERAL BIDS** on this contract must be accompanied by a copy of a Certificate of Eligibility issued by the Deputy Commissioner of the Massachusetts Division of Capital Asset Management (formerly the "DCPO") showing that the bidder has the classification and capacity rating to perform the work required. In order to be eligible to be awarded this contract, a general bidder must be certified by the DCAM for the total Project Cost, including all alternates elected (if applicable) to be taken by the Owner, and certified in the category of GENERAL BUILDING CONSTRUCTION.
- 5.2 Each general bid must also be accompanied by a Contractor Qualifications Statement Update ("Update Statement"). The Owner will furnish copies of the Update Statement form to bidders on request. (Note: A sample copy of the Update Statement is located at the end of this Section.). <u>Any general bid</u> <u>submitted without a currently valid Certificate of Eligibility and Update</u> <u>Statement shall be invalid and will not be accepted by the Owner.</u>

- 5.3 The Owner may at its discretion give the bidder notice of defects or omissions in the bidder's Update Statement and an opportunity to make revisions to this statement. A contractor's bid shall not be rejected if there are mistakes or omissions of form in its Update Statement, provided the contractor promptly corrects those mistakes or omissions upon request by the Owner.
- 5.4 The Owner will consider the information contained in the Update Statement, which it may verify by its own investigation, and material that it may request from the DCAM according to 810 CMR 4.03 (12) in determining whether the low bidder is eligible for contract award pursuant to M.G.L. Chapter 149, Section 44A (2). The Owners eligibility review of the low bidder will concentrate on the bidder's performance since its last certification by the DCAM, provided, however, that the Owner may bring information to the DCAM's attention concerning a contractor's qualifications, if the DCAM was not aware of that information when it certified the contractor.
- 5.5 The low bidder may not be awarded a contract which, when added to the cost to complete all other currently held contracts, would exceed the contractor's aggregate rating limit.
 - (1) The Owner will use the information provided in the Update Statement to compute the amount of work the bidder has underway.
 - (2) If the contractor provides the Owner with evidence that its outstanding balance of contracts will be within its aggregate rating limit by the start date of the project for which it is low bidder, the Owner may, at its discretion, make the contract award.
- 5.6 Should the lower bidder be determined not to be eligible, the Owner shall review the next low bidder's eligibility, in accordance with these procedures and the applicable legal requirements until a bidder is determined to be eligible for contract award.
- 5.7 The contract shall not be awarded to any bidder whose submitted background information when investigated and verified by the Owner, raises significant question as to his ability to successfully complete the project in question due to problems with his competence and responsibility.

SECTION 6 - WAGE RATES

- 6.1 Minimum rates of wages for work performed under this contract will be as predetermined by the Commissioner of Labor and Industries of the Commonwealth of Massachusetts in accordance with the provisions of Sections 26 to 27C, inclusive, of Chapter 149 of the Massachusetts General Laws.
- 6.2 Section 27B of said Chapter 149 provides record-keeping requirements for contractors and subcontractors with respect to employees, hours, wages and other matters.

6.3 Bidders' attention is called to Section 148 of Chapter 149 of the Massachusetts General Laws, relating to the weekly payment of wages.

SECTION 7 - SALES TAX

7.1 Section 6(f) of Chapter 54H of the Massachusetts General Laws exempts from Massachusetts sales tax, building materials and supplies to be used in the project, and bidders shall not include in their bids any amount therefore. The number of the certificate granted by the Commissioner of Revenue for use in obtaining the exemption may be obtained from the City of Worcester.

SECTION 8 - PREPARATION AND SUBMISSION OF BIDS

- 8.1 Each bid shall be submitted upon the bid forms furnished by the Owner, copies of which are bound with the bid documents. The bid forms may be submitted without the balance of the Contract Documents. All blank spaces shall be filled in, in ink or typewritten, in words or figures. The bid prices for each item on the bid forms shall be stated in both words and figures. Where itemized lump sum or unit prices are called for, the bidder shall provide all such prices. In the event of a discrepancy between prices written in words and prices written in figures, the written words shall govern. In the event of a discrepancy between the indicated sum of any column of figures and the correct sum thereof, the correct sum shall govern. The bid shall state the legal name of the bidder and shall be signed in ink by a person or persons legally authorized to bind the bidder to a contract. The name and title of the person or persons signing the bid shall be typed or printed below the signatures.
- 8.2 Each bid and the bid deposit (described below) shall be submitted to the Owner at the place stated in the Advertisement for Bids in a sealed envelope bearing on the outside the name of the bidder, his address and the title of the project for which the bid is submitted. If forwarded by mail, the sealed bid and the bid deposit shall be enclosed in an envelope with the notation "BID ENCLOSED" on the face and addressed as indicated in the Advertisement for Bids. A Certificate of Eligibility and an Update Statement in accordance with Section 5 shall if applicable, accompany each general bid.
- 8.3 Each sub-bid shall be submitted as specified in Paragraph 8.2 above, and, in addition, the notation "SUB-BID" and the name of the sub-trade for which the sub-bid is submitted shall be placed on the outside of the sealed envelope containing the sub-bid.
- 8.4 The Form for General Bid requires the general bidder to indicate whether performance and payment bonds will be required by the general bidder to be furnished by one or more filed sub-bidders. If the general bidder requests one or more filed sub-bidders to furnish such bonds, the general bidder must pay the premiums for all such bonds requested, and must include the costs of such premiums in his general bid.
- 8.5 Section 39L of Chapter 30 of the Massachusetts General Laws prohibits the Owner from entering into a contract for this work with, and shall not approve as a

subcontractor furnishing labor and materials for a part of any such work, a foreign corporation which has not filed with the Owner, a certificate of the State Secretary stating that such corporation has complied with Massachusetts General Laws Chapter 181, Sections 3 and 5. Therefore, every Foreign Corporation, whether submitting a general or sub-bid, must furnish a certified copy of its Certificate of Registration that has been duly filed with the State Secretary's office. Any bid, general or sub, of a foreign corporation submitted without a Certificate may be invalid and may be rejected pursuant to Section 11.

SECTION 9 - RECEIPT OF BIDS

- 9.1 All bidders are cautioned to allow ample time for transmittal of bids. Bidders are solely responsible for delivery to and receipt by the Owner of bids at the place stated in the Advertisement for Bids. Bids received after the specified time or at other than the specified location will not be accepted or recognized and will be returned to the Bidder unopened. The time of receipt will determine the acceptability of mailed bids, regardless of postmark.
- 9.2 Any bid may be withdrawn by the bidder or his duly authorized representative by written notice received by the Owner at the address for receipt of bids specified in the Advertisement for Bids prior to the time scheduled for the opening of such bids or authorized postponement thereof. No bid may be withdrawn for sixty (60) days, Saturdays, Sundays and legal holidays excluded, after the opening of general bids. No telephone or telegraphic bid, change in bid or withdrawal of bid will be received or recognized. A bid may be amended or modified only by withdrawing the bid and resubmitting another bid prior to the time for the opening of bids.
- 9.3 Bids will be opened and read publicly at the place and time stated in the Advertisement for Bids or the authorized postponement thereof. Bidders or their authorized representatives are invited to be present.

SECTION 10 - BID DEPOSIT

10.1 A bid deposit in the form of a bid bond, or cash, or a certified check must accompany each bid, or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the City of Worcester. A bid bond shall be (a) in form satisfactory to the Owner and substantially conforming to the sample contained in the Contract Documents, (b) with a Surety company qualified to do business (licensed) in the Commonwealth of Massachusetts and satisfactory to the Owner, and conditioned upon the faithful performance by the principal of the agreements contained in the bid. The bid deposit shall be in the amount of five (5) percent of the value of the bid.

SECTION 11 - REJECTION OF BIDS

11.1 The Owner reserves the right to reject any or all general bids if it were in the public interest to do so. The Owner reserves the right to reject any sub-bid on any sub-trade, if it determines that such sub-bid does not represent the sub-bid of a person competent to perform the work as specified or that less than three (3)

such sub-bids were received and that the prices are not reasonable for acceptance without further competition.

- 11.2 Within two (2) days, Saturdays, Sundays and legal holidays excluded, after opening sub-bids, the Owner will reject every sub-bid which is not accompanied by the required bid deposit or which otherwise does not conform to statutory requirements, or which is on a form not completely filled in, or which is incomplete, conditional or obscure, or which contains any addition not called for; provided, however, that the failure of the Owner to reject such a sub-bid within such period shall not validate such a sub-bid nor preclude the Owner from subsequently rejecting it.
- 11.3 The Owner shall reject every general bid and filed sub-bid which is not accompanied by the required bid deposit, or which otherwise does not conform to the statutory requirements or the bid documents.
- 11.4 The Owner reserves the right to reject any and all general bids which contains erasures, alterations, additions, errors or irregularities of any kind, or which contains proposed prices for any class or item of work which are, in the judgment of the Owner, substantially less or more than the actual cost to complete the work; provided, however, that the Owner reserves the right to waive any and all informalities as to form. Matters as to substance shall not be waived.

SECTION 12 - AWARD OF CONTRACT

- 12.1 The general contract will be awarded to the lowest responsible and eligible general bidder complying with the conditions and requirements provided in these Instructions, the bid forms and the other bid documents.
- 12.2 Award of the contract will be made within thirty (30) days, Saturdays, Sundays and legal holidays excluded, after (i) the opening of the general bids or (ii) the receipt by the Owner of any approvals necessary from federal or state agencies in connection with the project, whichever is later.
- 12.3 The successful bidder will be notified in writing, by mail or otherwise, that his bid has been accepted and that he has been awarded the contract. The successful bidder shall execute the contract and furnish the required bonds, at the offices of the Owner if requested, within five (5) days, Saturdays, Sundays and legal holidays excluded, after presentation of the contract to him or notice to him that the contract is ready for execution.
- 12.4 If the bidder selected as the general contractor fails to perform his agreement to execute the contract in accordance with the terms of his bid and furnish a performance bond and also a labor and materials payment bond as stated in his bid, the award will be made to the next lowest responsible and eligible general bidder, subject to the provisions of Sections 44A-44J, inclusive, of said Chapter 149 of the Massachusetts General Laws.
- 12.5 After the apparent lowest eligible and responsible general bidder is selected, it shall promptly confer with the Owner on the question of sub-bidders. Upon the

Owner's acceptance of the sub-bidders to be utilized, the selected bidder shall promptly present subcontracts to its filed sub-bidders, and in all cases, the presentment of subcontracts must be made a minimum of six days prior to the presentment of the general contract to the general bidder by the Owner. The general bidder shall submit copies of the executed subcontracts to the Owner as a prerequisite to the Owner's presentment of the general contract. As provided in the statutory subcontract form, the validity of the subcontracts is contingent upon execution of the general contract. [Massachusetts General Laws Chapter 149, Section 44F(4)(c)].

SECTION 13 - CERTIFICATES AND DOCUMENTS TO BE FURNISHED PRIOR TO EXECUTION OF THE CONTRACT

- 13.1 If the amount or the estimated amount of this contract is greater than \$100,000, then, pursuant, to Section 39R of Chapter 30 of the Massachusetts General Laws, the Contract Documents require the general contractor to make and keep books, records and accounts pertaining to the contractor's financial affairs and to file with the Deputy Commissioner of Capital Asset Management and the Owner the statements and certificates described below in Paragraphs 13.2, 13.3 and 13.4.
- 13.2 Prior to the execution of the contract the general contractor shall file with the Owner:
 - (1) A statement of management controls.
 - (2) A statement prepared and signed by an independent certified public accountant, stating that he and or she has examined the statement of management on internal accounting controls, and expressing an opinion as to:
 - (a) whether the representations of management are consistent with the result of management's evaluation of the system of internal accounting controls; and
 - (b) 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.
- 13.3 Prior to execution of the contract, and annually during the term of the contract, the general contractor shall file with the Deputy Commissioner of Capital Asset Management a Financial Statement prepared by an independent certified public accountant on the basis of an audit by such accountant. All statements shall be accompanied by an accountant's report.
- 13.4 Pursuant to Sections 49A of Chapter 62C of the Massachusetts General Laws the contractor must certify that it has complied with all laws of the Commonwealth of Massachusetts relating to taxes. A form of certificate for this purpose is included in the Contract Documents.

- 13.5 Prior to commencement of work, the contractor must furnish to the Owner certificates evidencing required insurance coverage in accordance with the provisions of the insurance requirements contained in the Supplementary General Conditions of the Contract.
- 13.6 The affidavit of compliance with certain laws of the Commonwealth relating to corporations, and evidence of corporate authority with respect to execution of the contract documents on behalf of the contractor, on the form contained in the bidding documents, must be furnished by the contractor to the Owner at the time of execution of the contract.
- 13.7 The general contractor as stated in the bid form must furnish a performance bond and a labor and materials payment bond, each in the amount of the contract sum. Such bonds must be on the forms similar to those contained in the bid documents and must be executed and delivered to the Owner at the time of execution of the contract. Each attorney-in-fact who executes such a bond on behalf of the surety must affix thereto a certified and current copy of his power of attorney.
- 13.8 A performance and a labor and materials payment bond furnished by a subcontractor, at the request of a general contractor, shall secure the performance of the sub-contract by the subcontract; and shall indemnify and hold harmless the general contractor and the surety or sureties under the labor and materials payment bond furnished by the general contractor to the Owner against (1) any and all and expense arising out of any and all claims in connection with the performance of said subcontract which would be required to be paid under the labor and materials payment bond furnished by the general contractor, after the notice, fails to assume the defense and defend such claims.
- 13.9 The subcontract agreement between the general contractor and each filed subcontractor shall be in the form contained in the Contract Documents bound with the instructions, as required by Section 44 F of said Chapter 149 of the Massachusetts General Laws.

SECTION 14 - FILED SUB-BID PROCEDURE

- 14.1 As stated in the Advertisement for Bids, the Owner has requested FILED SUB-BIDS on the following classes of work:
 - (1) Section 055000 METAL FABRICATIONS
 - (2) Section 071113 WATERPROOFING, DAMPROOFING & CAULKING
 - (3) Section 088000 GLASS & GLAZING
 - (4) Section 095113 ACOUSTICAL CEILING TILES
 - (5) Section 099123 INTERIOR PAINTING
 - (6) Section 120000 FIRE PROTECTION
 - (7) Section 220000 PLUMBING
 - (8) Section 230000 HVAC
 - (9) Section 260000 ELECTRICAL

- 14.2 Every sub-bidder duly filing a sub-bid with the Owner shall be bound thereby to every general bidder not excluded therein from the use thereof; and any variance from such sub-bid communicated to a general bidder shall be of no effect.
- 14.3 Each sub-bidder shall list in the sub-bid form the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the section of the specifications for that sub-trade requires such listings; provided that in the absence of a contrary provision in the specification, any sub-bidder may, without listing any bid price, list his own name for any such class of work or part thereof and perform that work with persons on his own payroll if such sub-bidder after sub-bid opening, shows to the satisfaction of the Owner that he does customarily perform such class of work or the part thereof with employees on his own payroll who are mechanics or laborers referred to in Section 26 of said Chapter 149, of the Massachusetts General Laws, and is qualified so to do.
- 14.4 **FILED SUB-BIDS** on this contract must be accompanied by a copy of a Certificate of Eligibility issued by the Deputy Commissioner of the Massachusetts Division of Capital Asset Management (formerly the "DCPO") showing that the bidder has the classification and capacity rating to perform the work required. In order to be eligible to be awarded this contract, each filed sub-bidder must be certified by the DCAM for their total Project Cost, including all alternates elected (if applicable) to be taken by the Owner, and certified in their respective trade category.
- 14.5 Each filed sub-bid must also be accompanied by a Contractor Qualifications Statement Update ("Update Statement"). The Owner will furnish copies of the Update Statement form to bidders on request. (Note: A sample copy of the Update Statement is located at the end of this Section.). <u>Any filed sub-bid submitted without a currently valid Certificate of Eligibility and Update Statement shall be invalid and will not be accepted by the Owner.</u>
- 14.6 Not later than the second day, Saturdays, Sundays and legal holidays excluded, before the day fixed by the Owner for the opening of general bids, the Owner shall mail to every person on record as having taken a set of Drawings and Specifications a list of sub-bidders arranged by sub-trades and listing for each sub-trade the name, address and sub-bid price of every sub-bidder submitting a sub-bid thereon not rejected by the Owner, and the general bidders excluded from using such sub-trade on the general bid form unless such person is included for such sub-trade in said list.
- 14.7 All sub-bidders, when finally selected, shall be notified in writing of their selection with forty-eight (48) hours thereafter by the general bidder. The selected general bidder and each of the selected sub-bidders shall promptly execute the subcontract agreements, and fully executed copies of all subcontract agreements shall be delivered to the Owner prior to presentment of the Owner-Contractor Agreement to the selected general bidder for execution. The selected General Bidder shall promptly and without delay, notify the Owner of any

selected sub-bidder who fails to execute a sub-contract or furnish the requisite bonds and/or insurance within five (5) days of presentment thereof.

SECTION 15 - MINORITY AND WOMEN BUSINESS ENTERPRISE PROGRAM

15.1 The Owner has established goals for the participation of minority and women contractors and subcontractors on all City projects. In furtherance thereof, the City of Worcester's Supplemental Equal Employment Opportunity Anti-Discrimination And Affirmative Action Program is included in the Bidding Documents, and all bidders shall comply with the requirements set forth therein. Any bidder who has any questions about the forms and procedures should contact Kenrick Haywood, Contract Compliance Office, City Hall, Room 404, Worcester, MA 01608, Telephone: (508) 799-1174.

SECTION 16 - RESPONSIBLE EMPLOYER ORDINANCE

16.1 The performance of the work derived from this bid is subject to the city's Responsible Employer Ordinance, Chapter 2, Section 35 of the Worcester Revised Ordinances (2008). Bidders are hereby instructed to review and familiarize themselves with the requirements thereof. The complete text of the ordinance is contained in the Supplementary General Conditions - Part I.

SAMPLE DCAM FORM CQ3 CERTIFICATE OF ELIGIBILITY UPDATE STATEMENT ON THE FOLLOWING PAGES

<u>SPECIAL NOTICE TO AWARDING AUTHORITY</u> BIDDERS' UPDATE STATEMENTS ARE NOT PUBLIC RECORDS AND ARE NOT OPEN TO PUBLIC INSPECTION (M.G.L. C.149, §44D)

<u>Commonwealth of Massachusetts</u> <u>Division of Capital Asset Management</u>

UPDATE STATEMENT

TO ALL BIDDERS AND AWARDING AUTHORITIES

A COMPLETED AND SIGNED UPDATE STATEMENT MUST BE SUBMITTED WITH EVERY BID FOR A CONTRACT SUBJECT TO M.G.L. C.149, §44A. ANY BID SUBMITTED WITHOUT AN APPROPRIATE UPDATE STATEMENT IS INVALID AND MUST BE REJECTED.

AWARDING AUTHORITIES

If the Awarding Authority determines that the bidder does not demonstrably possess the skill, ability, and integrity necessary to perform the work on the project, it must reject the bid.

BIDDER'S AFFIDAVIT

I swear under the pains and penalties of perjury that I am duly authorized by the bidder named below to sign and submit this Update Statement on behalf of the bidder named below, that I have read this Update Statement, and that all of the information provided by the bidder in this Update Statement is true, accurate, and complete as of the bid date.

Bid Date

Project Number (or name if no number)

Awarding Authority

SIGNATURE⇒

Print Name of Bidder

Business Address

Telephone Number

Bidder's Authorized Representative

Division of Capital Asset Management Form CQ3—Revised August, 2003 Page 1 of 9

INSTRUCTIONS

INSTRUCTIONS TO BIDDERS

- You must give complete and accurate answers to all questions and provide all of the information requested.
 MAKING A MATERIALLY FALSE STATEMENT IN THIS UPDATE STATEMENT IS GROUNDS FOR REJECTING YOUR BID AND FOR DEBARRING YOU FROM <u>ALL</u> PUBLIC CONTRACTING.
- Information is to cover the period from the date your most recent annual Certificate of Eligibility was issued (not extended) to the date of the bid.
- You must use this official form of Update Statement. Copies of this form may be obtained from the awarding authority and from the Asset Management Web Site: www.state.ma.us/cam/.
- If additional space is needed, please copy the appropriate page of this Update Statement and attach it as an additional sheet.
- See the section entitled "Bidding Limits" in the Instructions to Awarding Authorities for important information concerning your bidding limits.

INSTRUCTIONS TO AWARDING AUTHORITIES

Determination of Bidder Qualifications

- It is the awarding authority's responsibility to determine who is the lowest eligible and responsible bidder. You must consider <u>all</u> of the information in the low bidder's Update Statement in making this determination. <u>Remember</u>: this information was not available to the Division of Capital Asset Management at the time of certification.
- The bidder's performance on the projected listed in Parts 1 and 2 must be part of your review. Contact the project references.
- AWARDING AUTHORITIES ARE STRONGLY ENCOURAGED TO REVIEW THE LOW BIDDER'S ENTIRE CERTIFICATION FILE AT THE DIVISION OF CAPITAL ASSET MANAGEMENT. Telephone (617) 727-9320 for an appointment.

Bidding Limits

Single Project Limit: The total amount of the bid, including all alternates, may not exceed the bidder's Single Project Limit.

Aggregate Work Limit: The annual value of the work to be performed on the contract for which the bid is submitted, when added to the annual cost to complete the bidder's other currently held contracts, may not exceed the bidder's Aggregate Work Limit. Use the following procedure to determine whether the low bidder is within its Aggregate Work Limit:

Division of Capital Asset Management Form CQ3—Revised August, 2003 Page 2 of 9

<u>Step 1</u> Review Update Statement Question #2 to make sure that all requested information is provided and that the bidder has accurately calculated and totaled the annualized value of all incomplete work on its currently held contracts (column 9).

- <u>Step 2</u> Determine the annual dollar value of the work to be performed on your project. This is done as follows:
 - (i) If the project is to be completed in less than 12 months, the annual dollar value of the work is equal to the full amount of the bid.
 - (ii) If the project will take more than 12 months to complete, calculate the number of years given to complete the project by dividing the total number of months in the project schedule by 12 (calculate to 3 decimal places), then divide the amount of the bid by the calculated number of years to find the annual dollar value of the work.
- <u>Step 3</u> Add the annualized value of all of the bidder's incomplete contract work (the total of column 9 on page 5) to the annual dollar value of the work to be performed on your project. The total may not exceed the bidder's Aggregate Work Limit.

Correction of Errors and Omissions in Update Statements

<u>Matters of Form</u>: An awarding authority shall not reject a contractor's bid because there are mistakes or omissions of form in the Update Statement submitted with the bid, provided the contractor promptly corrects those mistakes or omissions upon request of the awarding authority. [810 CMR 4.09(1)].

<u>Correction of Other Defects</u>: An awarding authority may, in its discretion, give a contractor notice of defects, other than mistakes or omissions of form, in the contractor's Update Statement, and an opportunity to correct such defects, provided the correction of such defects is not prejudicial to fair competition. An awarding authority may reject a corrected Update Statement if it contains unfavorable information about the contractor that was omitted from the Update Statement filed with the contractor's bid. [810 CMR 4.09(2)].

PART 1 - COMPLETED PROJECTS

LIST ALL PUBLIC AND PRIVATE BUILDING PROJECTS YOUR FIRM HAS COMPLETED SINCE THE DATE YOUR CURRENT CERTIFICATE OF ELIGIBILITY WAS ISSUED (NOT EXTENDED). *

| DATE COMPLETED | | | |
|--------------------------|--|--|--|
| START DATE | | | |
| CONTRACT PRICE | | | |
| WORK CATEGORY | | | |
| PROJECT TITLE & LOCATION | | | |

Attach additional sheets if necessary

* If your firm has been terminated from a project prior to completion of the work or has failed or refused to complete its work under any contract, full details and an explanation must be provided. See Part 3 of this Update Statement.

Page 3 of 9

PROVIDE THE FOLLOWING REFERENCE INFORMATION FOR EACH COMPLETED PROJECT LISTED ON THE PREVIOUS PAGE.

REGIONAL EMERGENCY

COMMUNICATIONS CENTER

| PROJECT TITLE | COMPANY NAME | CONTACT PERSON TELEPHC | ONE |
|--|---|--|-----|
| | OWNER | | |
| | DESIGNER | | |
| | GC | | |
| | OWNER | | |
| | DESIGNER | | |
| | GC | | |
| | OWNER | | |
| | DESIGNER | | |
| | GC | | |
| | OWNER | | |
| | DESIGNER | | |
| | GC | | |
| | OWNER | | |
| | DESIGNER | | |
| | GC | | |
| | OWNER | | |
| | DESIGNER | | |
| | GC | | |
| ls your company or any inc contractor named above, e | lividual who owns, manages or controls your com ither through a business or family relationship? | pany affiliated with any owner, designer or general □ YES □ NO | |
| Are any of the contact pers company, either through a | ons named above affiliated with your company or business or family relationship? | r any individual who owns, manages or control your | |

If you have answered YES to either question, explain.

| S YOUR FIRM HAS UNDER | ED. | |
|---|-------------------------------------|--|
| ND NON-BUILDING CONSTRUCTION PROJECT | F WHEN OR WHETHER THE WORK COMMENC | |
| LIST ALL PUBLIC AND PRIVATE BUILDING AN | CONTRACT ON THIS DATE REGARDLESS OF | |

| | | | | |
|--------|---|------|------|-------------------|
| 5) | ANNUALIZED VALUE OF INCOMPLETE WORK (col. 7 + col. 8) | | | |
| Ø | NO. OF YEARS REMAINING (see note below) | | | |
| 1 | \$ VALUE OF WORK NOT COMPLETE (col. 5 x. col. 6) | | | of Column 9) |
| Q | % NOT COMPLET E | | | /ORK (Total |
| с С | CONTRACT PRICE | | | ONTRACT W |
| 4 | ON SCHEDULE (yes / no) | | | OMPLETE C |
| S | START AND END DATES | | | DF <u>ALL</u> INC |
| 2 | WORK CATEGORY | | | IZED VALUE |
| - | PROJECT TITLE & LOCATION | | | ANNUAL |

 If less than one year is left in the project schedule, write 1. Column 8

If more than 12 months are left in the project schedule, divide the number of months left in the project schedule by 12 (calculate to three decimal places).
 PROVIDE THE FOLLOWING REFERENCE INFORMATION FOR EACH INCOMPLETE PROJECT LISTED ON THE

PREVIOUS PAGE.

Page 5 of 9

INSTRUCTIONS TO BIDDERS

| PROJECT TITLE | COMPANY NAME | CONTACT PERSON TEL | EPHONE |
|---|---|--|--------|
| | OWNER | | |
| | DESIGNER | | |
| | GC | | |
| | OWNER | | |
| | DESIGNER | | |
| | GC | | |
| | OWNER | | |
| | DESIGNER | | |
| | GC | | |
| | OWNER | | |
| | DESIGNER | | |
| | GC | | |
| | OWNER | | |
| | DESIGNER | | |
| | GC | | |
| | OWNER | | |
| | DESIGNER | | |
| | GC | | |
| ls your company or any indi contractor named above eitl | ividual who owns, manages or controls your co her through a business or family relationship? | mpany affiliated with any owner, designer or gener □ YES □ NO | al |
| Are any of the contact perso company, either through a t | ons named above affiliated with your company business or family relationship? | or any individual who owns, manages or control yo | ur |
| If you have answered YES t | to either question, explain. | | |

Page 6 of 9

PART 3 - PROJECT PERFORMANCE

Please answer the following questions. Information is to cover the period from the date your current Certificate of Eligibility was issued to the bid date.

If you answer YES to any question, on a separate page provide a complete explanation. Include all details [project name(s) and location(s), names of all parties involved, relevant dates, etc.].

| | | YES | NO |
|---|--|-----|----|
| A. Has your firm been terminat | ed on any contract prior to completing its work? | | |
| B. Has your firm failed or refuse any contract prior to substar | ed either to perform or complete any of its work under ntial completion? | | |
| C. Has your firm failed or refuse | ed to complete any punchlist work under any contract? | | |
| D. Has your surety taken over o contract? | or been asked to complete any of your work under any | | |
| E. Has your surety made paym payment bond on any contra | ent to a materials supplier or other party under your act? | | |
| F. Has any subcontractor filed authority on a public project | a demand for direct payment with an awarding for any of your contracts? | | |
| G. Have any of your subcontra- mechanic's lien against prop supplied under any of your of | ctors or suppliers filed litigation to enforce a perty in connection with work performed or materials contracts? | | |
| H. Have there been any deaths any of your projects? | s of employee or others occurring in connection with | | |
| Has any employee or other p in excess of thirty working d | person suffered an injury resulting in complete disability ays in connection with any of your projects? | | |

PART 4 - LEGAL PROCEEDINGS

Please answer the following questions. Information is to cover the period from the date your current Certificate of Eligibility was issued to the bid date.

The term "<u>Administrative Proceeding</u>" as used in this Update Statement includes (i) any action or proceeding brought by a governmental agency, department or officer to enforce any law, regulation, code or other legal requirement, except for those brought in state or federal courts, and (ii) any action taken by a governmental agency, department or officer imposing penalties, fines or other sanctions for failure to comply with any such legal requirement.

If you answer YES to any question, on a separate page provide a complete explanation of each proceeding and any judgement or decision. Include all details (name of court or administrative agency, title of case or proceeding, case number, date action was commenced, date judgement or decision was entered, fines or penalties imposed, etc.).

YES NO

Division of Capital Asset Management Form CQ 3 - Revised August, 2000 Page 7 of 9

| A. | Have any judicial proceedings (other than criminal proceedings) been brought or concluded adversely against your firm or a principal or officer of your firm relating to the procurement or performance of any construction contract, including actions to obtain payment brought by subcontractors, suppliers or others? | |
|----|--|--|
| B. | Have any criminal proceedings been brought or concluded adversely against your firm or a principal or officer of your firm relating to any of the following offenses: graft, embezzlement, forgery, bribery, falsification or destruction of records, receipt of stolen property or environmental offenses? | |
| C. | Have any judicial or administrative proceedings been brought or concluded adversely against your firm or a principal or officer of your firm relating to a violation of state or federal antitrust laws arising out of the submission of bids or proposals? | |
| D. | Have any judicial or administrative proceedings been brought or concluded adversely against your firm or a principal or officer of your firm relating to a violation of state or federal laws regulating campaign contributions? | |
| E. | Have any judicial or administrative proceedings been brought or concluded adversely against your firm or a principal or officer of your firm relating to a violation of chapter 268A of the Massachusetts General Laws? | |
| F. | Have any judicial or administrative proceedings been brought or concluded adversely against your firm or a principal or officer of your firm relating to a violation of any state or federal law regulating prevailing wages? | |
| G. | Have any judicial or administrative proceedings been brought or concluded adversely against your firm or a principal or officer of your firm relating to a violation of any state or federal law regulating hours of labor, minimum wages, overtime pay, equal pay, child labor or worker's compensation? | |
| Н. | Have any judicial or administrative proceedings been brought or concluded adversely against your firm or a principal or officer of your firm relating to a violation of any state or federal law prohibiting discrimination in employment? | |
| I. | Have any judicial or administrative proceedings been brought or concluded adversely against your firm or a principal or officer of your firm relating to a claim of repeated or aggravated violation of any state or federal law regulating labor relations or occupational health or safety? | |
| J. | Have any proceedings been brought by any state or federal agency to debar or suspend your firm or any principal or officer of your firm from public contracting? | |
| К. | Has your firm been fined by OSHA or any other state or federal agency for violations of any laws or regulations related to occupational health or safety? | |

PART 5 - SUPERVISORY PERSONNEL

Division of Capital Asset Management Form CQ 3 - Revised August, 2000 Page 8 of 9

List all supervisory personnel, such as project managers and superintendents, who will be assigned to the project if your firm is awarded the contract. **Attach the resume of each person listed below**.

| NAME | TITLE OR FUNCTION |
|------|-------------------|
| | |
| | |
| | |
| | |

PART 6 - CHANGES IN BUSINESS ORGANIZATION OR FINANCIAL CONDITION

Have there been any changes in your firm's business organization, financial condition or bonding capacity since the date your current Certificate of Eligibility was issued? Yes No If YES, attach a separate page providing complete details.

Division of Capital Asset Management Form CQ 3 - Revised August, 2000 Page 9 of 9

END OF SECTION



CITY OF WORCESTER

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

TABLE OF ARTICLES

1. GENERAL PROVISION

- 1.1 Definitions
- 1.2 The Contract
- 1.3 The Work
- 1.4 The Project
- 1.5 Execution, Correlation & Intent
- 1.6 Ownership and Use of Documents

2. ARCHITECT

- 2.1 Definition
- 2.2 Administration of the Contract

3. OWNER

- 3.1 Definition
- 3.2 Information and Services Required of the Owner
- 3.3 Owner's Right to Stop the Work
- 3.4 Owner's Right to Carry Out the Work

4. CONTRACTOR

- 4.1 Definition
- 4.2 Review of Contract Documents
- 4.3 Supervision and Construction Procedures
- 4.4 Labor and Materials
- 4.5 Warranty
- 4.6 Taxes
- 4.7 Permits, Fees and Notices
- 4.8 Allowances
- 4.9 Project Management
- 4.10 Progress Schedule
- 4.11 Documents and Samples at the Site
- 4.12 Shop Drawings, Project Data and Samples
- 4.13 Use of Site
- 4.14 Cutting and Patching Work
- 4.15 Cleaning Up

- 4.16 Communications
- 4.17 Royalties and Patents
- 4.18 Indemnification

5. SUBCONTRACTOR

- 5.1 Definition
- 5.2 Award of Subcontracts and other Contracts for Portions of the Work
- 5.3 Subcontractual Relations

6. WORK BY OWNER OR BY SEPARATE CONTRACTORS

- 6.1 Owner's Right to Perform Work and to Award Separate Contracts
- 6.2 Mutual Responsibility
- 6.3 Owner's Right to Clean Up

7. MISCELLANEOUS PROVISIONS

- 7.1 Governing Law
- 7.2 Successors and Assigns
- 7.3 Written Notice
- 7.4 Consent on Waiver
- 7.5 Performance Bond and Labor and Material Payment Bond
- 7.6 Rights and Remedies
- 7.7 Tests

8. TIME

- 8.1 Definitions
- 8.2 Progress and Completion
- 8.3 Delays and Extensions of Time

9. PAYMENTS AND COMPLETION

- 9.1 Contract Sum
- 9.2 Schedule of Values
- 9.3 Applications for Payment
- 9.4 Certificates for Payment
- 9.5 Progress Payments
- 9.6 Payments Withheld
- 9.7 Failure of Payment
- 9.8 Substantial Completion
- 9.9 Final Completion and Final Payment

10. PROTECTION OF PERSONS AND PROPERTY

- 10.1 Safety Precautions and Programs
- 10.2 Safety of Persons and Property
- 10.3 Emergencies

11. INSURANCE

- 11.1 Contractor's Liability Insurance
- 11.2 Owner's Liability Insurance
- 11.3 Property Insurance
- 11.4 Loss of Use Insurance

12. CHANGE IN THE WORK

- 12.1 Change Orders
- 12.2 Claims for Additional Cost
- 12.3 Minor Changes in the Work
- 12.4 Equitable Adjustments

13. UNCOVERING AND CORRECTION OF WORK

- 13.1 Uncovering of Work
- 13.2 Correction of Work
- 13.3 Acceptance of Defective or Non-Conforming Work



GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

ARTICLE 1 - GENERAL PROVISIONS

1.1 **DEFINITIONS**

1.1.1 THE CONTRACT DOCUMENTS

1.1.1.1 The Contract Documents consist of the Owner-Contractor Agreement, the Conditions of the Contract (General, Supplementary and other Conditions), Performance Bond, Payment Bond, Vote of Corporation, Instructions to Bidders, Bid Proposal, the Drawings, the Specifications, and all Addenda issued prior to and all Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a written interpretation issued by the Architect pursuant to Article 2, or (4) a written order for a minor change in the Work issued by the Architect pursuant to Article 12. The Contract Documents do not include Bidding Documents such as, sample forms, or portions of Addenda relating to any of these, or any other documents, unless specifically enumerated in the Owner-Contractor Agreement. The Drawings of this Contract shall be as listed on the cover sheet of the Drawings, as applicable. The Specifications of this Contract shall be listed on the Index to the Technical Specifications.

In the event of any conflict among the Contract Documents, the Documents shall be construed according to the following priorities: Highest Priority - Modifications, Second Priority- Agreement, Third Priority - Addenda-later date to take precedence, Fourth Priority - Special Requirements, Fifth Priority - Special Conditions, Sixth Priority - Supplementary General Conditions, Seventh Priority - General Conditions, Eighth Priority - Specifications, Ninth Priority - Drawings.

1.2 THE CONTRACT

1.2.1 The Contract Documents form the Contract for Construction. This Contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification as defined in Article 1. These General Conditions, wherever applicable, shall be construed consistent with, and not to the exclusion of any terms of the Owner-Contractor Agreement, provided further however, that the terms of such Agreement shall take precedence, as provided in Article 1. Except for the special agreements in Article 4, nothing contained in the Contract Documents shall be construed to create any contractual relationship of any kind between the Architect and the Contractor. Nothing contained in the Contract Documents shall create

any contractual relationship between the Owner or the Architect and any Subcontractor or Sub-subcontractor.

1.3 THE WORK

1.3.1 The Work comprises the completed construction required by the Contract Documents and includes all labor necessary to produce such construction, and all materials and equipment incorporated or to be incorporated in such construction.

1.4 THE PROJECT

1.4.1 The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part.

1.5 EXECUTION, CORRELATION AND INTENT

- 1.5.1 The Owner and Contractor shall sign the Contract Documents in duplicate.
- 1.5.2 By executing the Contract, the Contractor represents that he has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents.
- 1.5.3 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Work not covered in the Contract Documents will not be required unless it is consistent therewith and is reasonably inferable therefrom as being necessary to produce the intended results. Words and abbreviations, which have well-known technical or trade meanings are used in the Contract Documents in accordance with such, recognized meanings. All work mentioned or indicated in the Contract Documents shall be performed by the Contractor as part of this Contract unless it is specifically indicated in the Contract Documents that such work is to be done by others. Should the drawings or the Specifications disagree in themselves or with each other, the Contractor shall provide the better quality or greater quantity of work and/or materials unless otherwise directed by written addendum to the Contract.
- 1.5.4 The organization of the Specifications into divisions, sections and articles, and the arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. The Contractor and all Subcontractors shall refer to all of the Drawings, including those showing primarily the work of the mechanical, electrical and other specialized trades, 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.
- 1.5.5 All indications or notations which apply to one of a number of similar situations, materials or processes shall be deemed to apply to all such situations, materials or processes wherever they appear in the Work, except where a contrary result is clearly indicated by the Contract Documents.

- 1.5.6 Where codes, standards, requirements and publications of public and private bodies are referred to in the Specifications, references shall be understood to be to the latest revision prior to the date of receiving bids, except where otherwise indicated.
- 1.5.7 Where no explicit quality or standards for materials or workmanship are established for work, such work is to be of good quality for the intended use and consistent with the quality of the surrounding work and of the construction of the Project generally.
- 1.5.8 All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the Contract Documents.
- 1.5.9 The Mechanical and Electrical Drawings are diagrammatic only, and are not intended to show the exact physical locations or configurations of work. Such work shall be installed to clear all obstructions, permit proper clearances for the work of other trades, and present an orderly appearance where exposed. Exact locations of fixtures and outlets shall be obtained from the Architect as provided in Article 4 before the work is roughed in; work installed without such information from the Architect shall be relocated at the Contractor's expense.
- 1.5.10 Except for work governed by M.G.L. c.149 §44F, the Owner and Architect assume no liability arising out of jurisdictional issues raised or claims advanced by trade organizations or other interested parties based on the arrangement or manner of subdivision of the content of the Plans and Specifications. The Contractor shall make all necessary arrangements to reconcile any such jurisdictional conflicts without delay, damage, or cost to the Owner, unless otherwise agreed to by the parties hereto.

1.6 OWNERSHIP AND USE OF DOCUMENTS

1.6.1 All Drawings and Specifications furnished by the Architect, and all copies thereof and the copyright therein, are the property of the Architect or the Owner. They are to be used only with respect to this Project and are not to be used on any other project. With the exception of one contract set for each party to the Contract, such documents are to be returned or suitably accounted for to the Architect on request at the completion of the Work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Owner's common law copyright or other reserved rights.

ARTICLE 2 - ARCHITECT

2.1 **DEFINITION**

2.1.1 The Architect is the person lawfully licensed to practice Architecture, or an entity lawfully practicing architecture identified as such in the Owner-Contractor Agreement, and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Architect means the Architect or his Authorized Representative.

2.2 ADMINISTRATION OF THE CONTRACT
- 2.2.1 The Architect will provide administration of the Contract as herein described and pursuant to the terms of the Design Services Agreement between the Architect and the Owner.
- 2.2.2 The Architect will be the Owner's representative during construction and until final payment is due. The Architect will advise and consult with the Owner. The Owner's instructions to the Contractor shall be forwarded through the Architect. The Architect will have the authority to act on behalf of the Owner only to the extent provided in the Contract Documents and the Design Services Agreement between the two, unless otherwise modified by written instrument in accordance with Article 2.
- 2.2.3 The Architect will visit the site at intervals appropriate to the stage of construction to familiarize himself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of his on-site observations as an Architect, he will keep the Owner informed of the progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work of the Contractor.
- 2.2.4 The Architect will not be responsible for, and will not have control or charge of, construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and he will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Architect will not be responsible for or have control or charge over the acts or omissions of the Contractor, Subcontractors, or any of their agents or employees, or any other persons performing any of the Work.
- 2.2.5 The Architect shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so the Architect may perform his functions under the Contract Documents.
- 2.2.6 Based on the Architect's observations and an evaluation of the Contractor's Applications for Payment, the Architect will determine the amounts owing to the Contractor and will issue Certificates for Payment in such amounts, as provided in Article 9.
- 2.2.7 The Architect will be the interpreter of the requirements of the Contract Documents and the judge of the performance there under by both the Owner and Contractor.
- 2.2.8 The Architect will render interpretations necessary for the proper execution or progress of the Work, with reasonable promptness and in accordance with M.G.L. Chapter 30, Section 39P, or any lesser time limit agreed upon. Either party to the Contract may make written request to the Architect for such interpretations.
- 2.2.9 Claims, disputes and other matters in question between the Contractor and the Owner relating to the execution of progress of the Work or the interpretation of the Contract Documents shall be referred initially to the Architect for decision, which he will render in writing within a reasonable time.

- 2.2.10 All interpretations and decisions of the Architect shall be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. In his capacity as interpreter and judge, he will endeavor to secure faithful performance by both the Owner and the Contractor, will not show partiality to either, and will not be liable for the result of any interpretation or decision rendered in good faith, and in the absence of negligence, in such capacity.
- 2.2.11 The Architect's decisions in matters relating to artistic effect will be final if consistent with the intent of the Contract Documents.
- 2.2.12 The Architect will have authority to reject Work, which does not conform to the Contract Documents. Whenever, in his opinion, he considers it necessary or advisable for the implementation of the intent of the Contract Documents, he will have authority to require special inspection or testing of the Work in accordance with Article 7, whether or not such Work be then fabricated, installed or completed. However, neither the Architect's authority to act under this Article 2 nor any decision made by him in good faith either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of the Architect to the Contractor, any Subcontractor, any of their agents or employees, or any other person performing any of the Work.
- 2.2.13 The Architect will review and approve or take other appropriate action upon Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for conformance with the design concept of the Work and with the information given in the Contract Documents. Such action shall be taken with reasonable promptness so as to cause no delay. The Architect's approval of a special item shall not indicate approval of an assembly of which the item is a component.
- 2.2.14 The Architect will prepare Change Orders in accordance with Article 12, and will have authority to order minor changes in the Work as provided in Article 12.
- 2.2.15 The Architect will conduct inspections to determine the dates of Substantial Completion and final completion, will receive and forward to the Owner for the Owner's review written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate of Payment upon compliance with the requirements of Article 9.
- 2.2.16 In case of the termination of the employment of the Architect, the Owner shall appoint an Architect against whom the Contractor makes no reasonable objection whose status under the Contract Documents shall be that of former Architect.

ARTICLE 3 - OWNER

3.1 **DEFINITION**

3.1.1 The term Owner means the City of Worcester, acting by and through its city manager and such representatives as the city manager shall assign to the Project.

3.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

- 3.2.1 The Owner shall, at the request of the Contractor, at the time of execution of the Owner-Contractor Agreement, furnish to the Contractor reasonable evidence that he has made financial arrangements to fulfill his obligations under the Contract. Unless such reasonable evidence is furnished, the Contractor is not required to execute the Owner-Contractor Agreement or to commence the Work.
- 3.2.2 The Owner shall furnish existing surveys, if any, describing the physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site.
- 3.2.3 Except as provided in Article 4, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for the construction, use or occupancy of permanent structures or for permanent changes in existing facilities.
- 3.2.4 The Owner shall furnish information or services under the Owner's control with reasonable promptness after receipt from the Contractor of a written request for such information or services.
- 3.2.5 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, all copies of available bid documents, Drawings, and Specifications. The Contractor may at any time order additional sets at the Contractor's expense.
- 3.2.6 The Owner shall forward all instructions to the Contractor through the Architect.
- 3.2.7 The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to Work by Owner or by Separate Contractors, Payments and Completion, and Insurance in Articles 6, 9 and 11 respectively.

3.3 OWNER'S RIGHT TO STOP THE WORK

3.3.1 If the Contractor fails to correct defective Work as required by Artilce 13 or persistently fails to carry out the Work in accordance with the Contract Documents, the Owner, by a written order signed personally or by an agent specifically so empowered by the Owner in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Owner to stop the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Article 6.

3.4 OWNER'S RIGHT TO CARRY OUT THE WORK

3.4.1 3.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within ten (10) days after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to any other remedy he may have, make good such deficiencies. In such case an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and the amount

charged to the Contractor are both subject to prior notice being given to the Architect by the Owner. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

ARTICLE 4 - CONTRACTOR

4.1 **DEFINITION**

4.1.1 The Contractor is the person or entity identified as such in the Owner-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Contractor means the Contractor or his Authorized Representative.

4.2 **REVIEW OF CONTRACT DOCUMENTS**

- 4.2.1 Before starting the Work, and at frequent intervals during the progress thereof, the Contractor shall carefully study and compare the Agreement, Conditions of the Contract, Drawings, Specifications, Addenda and other Contract Documents and shall at once report to the Architect any error, inconsistency or omission he may discover. Any necessary change shall be ordered as provided in Article 12 and other provisions of the Contract Documents. If the Contractor proceeds with the Work without such notice to the Architect, having discovered such errors, inconsistencies or omissions, or if by reasonably study of the Contract Documents he could have discovered such, the Contractor shall bear all costs arising there from.
- 4.2.2 The Contractor shall give the Architect timely notice of any additional design drawings, specifications, or instructions required to define the Work in greater detail, or to permit the proper progress of the Work.
- 4.2.3 The Contractor shall not proceed with any Work not clearly and consistently defined in detail in the Contract Documents, but shall request additional drawings or instructions from the Architect as provided in Article 4. If the Contractor proceeds with such Work without obtaining further drawings or instructions, he shall correct Work incorrectly done at his own expense.
- 4.2.4 The Contractor may submit Requests For Information (RFI) to the Architect to help facilitate the Contractor's performance of the Contract. Prior to submitting each RFI, the Contractor shall first carefully study and compare the Contract Documents, field conditions, other Owner provided information, Contractor and Subcontractor prepared Coordination Drawings and prior Project correspondence and documentation to determine that the information to be requested is not reasonably obtainable from such sources after such careful study and comparison.
- 4.2.5 Each RFI shall be submitted by the Contractor to the Architect for determination. Each RFI shall be in writing, on such form and with such accompanying information as the Architect may require for such purpose. Each RFI shall identify a single item or topic and the specific sources which were reviewed by the Contractor in its efforts to determine the information requested, and a statement that the information being requested could not be determined from such sources.

- 4.2.6 The Contractor shall submit each RFI sufficiently in advance of the date by which such information is required in order to allow the Architect sufficient time, in the Architect's professional judgment, to permit adequate review and response and to permit Contractor compliance with the latest Construction Schedule.
- 4.2.7 The Contractor shall reimburse the Owner amounts charged to the Owner by the Architect for responding to excessive or unnecessary RFI's where such information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner provided information, Contractor prepared Coordination Drawings, or project correspondence or documentation.

4.3 SUPERVISION AND CONSTRUCTION PROCEDURES

- 4.3.1 The Contractor shall supervise and direct the Work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract.
- 4.3.2 The Contractor shall be responsible to the Owner for the acts and omissions of his employees, Subcontractors and their agents and employees, and other persons performing any of the Work under a contract with the Contractor.
- 4.3.3 The Contractor shall not be relieved from his obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Architect in his administration of the Contract, or by inspections, tests or approvals required or performed under Article 7 by persons other than the Contractor.
- 4.3.4 Where the Contract Documents refer to particular construction means, methods, techniques, sequences or procedures or indicate or imply that such are to be used in the Work, such mention is intended only to indicate that the operations of the Contractor shall be as to produce at least the quality of work implied by the operations described, but the actual determination of whether or not the described operations may be safely and suitably employed on the Work shall be the responsibility of the Contractor, who shall notify the Architect in writing of the actual means, methods, techniques, sequences or procedures which will be employed on the Work, if these differ from those mentioned in the Contract Documents. All loss, damage, or liability, or cost of correcting defective work arising from the employment of any construction means, methods, techniques, sequences or procedures shall be borne by the Contractor, notwithstanding that such construction means, methods, techniques, sequences or procedures are referred to, indicated or implied by the Contract Documents, unless the Contractor has given timely notice to the Architect in writing that such means, methods, techniques, sequences or procedures are not safe or suitable, and the Contractor has then been instructed in writing by the Owner to proceed at the Owner's risk.

4.4 LABOR AND MATERIALS

4.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and

whether or not incorporated or to be incorporated in the Work. The word 'provide' shall mean furnish and install complete, including connections, unless otherwise specified.

- 4.4.2 The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to him.
- 4.4.3 The Contractor shall procure its materials from such sources and employ labor subject to contract terms and conditions so as to ensure harmonious labor relations on the site and prevent strikes or labor disputes. The Contractor, in the event of a labor dispute including strikes, shall take the necessary and appropriate action required at no expense to the Owner to prevent the disruption of the Work.

4.5 WARRANTY

- 4.5.1 The Contractor warrants to the Owner and the Architect that all materials and equipment furnished under this Contract will be new and of recent manufacture unless otherwise specified, and that all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective.
- 4.5.2 The Contractor shall be responsible for determining that all materials furnished for the Work meet all requirements of the Contract Documents. The Architect may require the Contractor to produce reasonable evidence that a material meets such requirements, such as certified reports of past tests by qualified testing laboratories, reports of studies by qualified experts, or other evidence which, in the opinion of the Architect, would lead to a reasonable certainty that any material used, or proposed to be used, in the Work meets the requirements of the Contract Documents. All such data shall be furnished at the Contractor's expense. This provision shall not require the Contractor to pay for periodic testing of different batches of the same material, unless such testing is specifically required by the Contract Documents to be performed at the Contractor's expense.
- 4.5.3 If the Contractor proposed to use a material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, he shall inform the Architect in writing of the nature of such deviations at the time the material is submitted for approval, and shall request written approval of the deviation from the requirements of the Contract Documents.
- 4.5.4 In requesting approval of the deviations or substitutions, the Contractor shall provide, upon request, evidence leading to a reasonable certainty that the proposed substitution or deviation will provide a quality of result at least equal to that otherwise attainable. If, in the opinion of the Architect, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Architect may reject such substitution or deviation without further investigation.
- 4.5.5 The Contract Documents are intended to produce a building of consistent character and quality of design. All components of the building including visible items of mechanical and electrical equipment have been selected to have a coordinated design in relation to the overall appearance of the building. The Architect shall judge the design and

appearance of proposed substitutes on the basis of their suitability in relation to the overall design of the project, as well as for their intrinsic merits. The Architect will not approve as equal to materials specified proposed substitutes, which, in his opinion, would be out of character, obtrusive, or otherwise inconsistent with the character or quality of design of the project. In order to permit coordinated design of color and finishes the Contractor shall, if required by the Architect, furnish the substituted material in any color, finish, texture, or pattern which would have been available from the manufacturer originally specified, at no additional cost to the Owner.

- 4.5.6 Any additional cost, or any loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the Contractor, notwithstanding approval or acceptance of such substitution by the Owner or the Architect, unless such substitution was made at the written request or direction of the Owner.
- 4.5.7 The warranty provided in this Article 4 shall be in addition to and not in limitation of any other warranty required by the Contract Documents or otherwise prescribed by law.
- 4.5.8 The Contractor shall procure and deliver to the Architect, no later than the date claimed by the Contractor as the date of Substantial Completion, all special warranties required by the Contract Documents. Delivery by the Contractor shall constitute the Contractor's guarantee to the Owner that the warranty will be performed in accordance with its terms and conditions.
- 4.5.9 The Contractor shall guarantee all Work for a period of a minimum of one year (unless otherwise required in the specifications to have a longer warranty time) after Date of Substantial Completion or by the terms of any special warranty required by the Contract Documents. The Contractor shall, upon written notice from the Architect, promptly correct defective Work or Work not in accordance with the Contract Documents.

4.6 TAXES

- 4.6.1 The Contractor shall pay all sales, consumer, use and other similar taxes for the Work or portions thereof provided by the Contractor which are legally enacted at the time bids are received, whether or not yet effective.
- 4.6.2 IMPORTANT TAX NOTE: This project, being constructed for a political subdivision of the Commonwealth of Massachusetts, is exempt from certain taxes. It is therefore required that the Contractor and all Subcontractors purchasing taxable goods covered by the governing tax codes make known to suppliers the tax-exempt status of the institution in order that such taxes will not appear in the Contract Sum. The Owner will provide the necessary evidence and certificates of its tax exemption upon request of those concerned. The most applicable taxes concerned are:
 - (1) Federal Excise Taxes as applied to articles, which are taxable under Chapter 12 of the Internal Revenue Code of 1954, as amended.
 - (2) Commonwealth of Massachusetts Sales Tax.
 - (3) Tax Exempt Number: 046-001-418.

4.7 PERMITS, FEES AND NOTICES

- 4.7.1 The Contractor and all subcontractors shall secure, coordinate and pay for the building permit and for all other permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the Work.
- 4.7.2 The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations, and lawful orders of any public authority bearing on the performance of the Work.
- 4.7.3 It is not the responsibility of the Contractor to make certain the Contract Documents are in accordance with the applicable laws, statutes, building codes and regulations. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify the Architect in writing, and any necessary changes shall be accomplished by appropriate Modification.
- 4.7.4 If the Contractor performs any Work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Architect, he shall assume full responsibility therefore and shall bear all costs attributable thereto.

4.8 ALLOWANCES

4.8.1 Note that the use of such Allowances are prohibited in any contract or work subject to the provisions of M.G.L. c. 149, §44A.

4.9 **PROJECT MANAGEMENT**

- 4.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site full time daily including work performed outside normal working hours during the progress of the Work until the date of substantial completion, and for such additional time thereafter as the Architect may determine to be necessary for the expeditious completion of the Work. Only under extenuating circumstances, and with approval of the Architect and Owner, will the Contractor be allowed to substitute superintendents prior to the date of Substantial Completion. The superintendent shall represent the Contractor and all communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be so confirmed on written request in each case.
- 4.9.2 The Contractor shall retain a competent Registered Professional Engineer or Registered Land Surveyor, acceptable to the Architect and Owner who shall establish the exterior lines and required elevations of all buildings and structures to be erected on the site and shall establish sufficient lines and grades for the construction of associated work such as, but not limited to, roads, utilities and site grading. The Engineer or Land Surveyor shall certify as to the actual location of the constructed facilities in relation to property lines, building lines, easements, and other restrictive boundaries.
- 4.9.3 The Contractor shall attend job meetings with the Architect and such other persons as the Architect may from time to time wish to have present. The Contractor shall be represented by a principal, project manager, general superintendent or other authorized

main office representative, as well as by the Contractor's own superintendent. An authorized representative of any Subcontractor or Sub-subcontractor shall attend such meetings, if the representative's presence is requested by the Architect. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings including costs, payments, change orders, time schedules and manpower. Any notices required under the Contract may be serviced on such representatives. Refer to specification section 01200 Project Meetings for additional requirements.

- 4.9.4 The Contractor shall establish the building grades, lines, levels, column, wall, and partition lines required by the various subcontractors in laying out their work.
- 4.9.5 The Contractor shall coordinate and supervise the work performed by Subcontractors to the end that the work is carried out without conflict between trades and so that no trade at any time causes delay to the general progress of the Work. The Contractor and all Subcontractors shall at all times afford each trade, any separate contractor, or the Owner, every reasonable opportunity for the installation of work and the storage of materials.

4.10 PROGRESS SCHEDULE

4.10.1 The Contractor shall prepare and submit to the Architect a progress schedule as described in Article 8.

4.11 DOCUMENTS AND SAMPLES AT THE SITE

- 4.11.1 The Contractor shall maintain at the site for the Owner a record copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record all changes made during construction, and approved Shop Drawings, Product Data and Samples. These shall be available to the Architect and shall be delivered to him for the Owner upon completion of the Work.
- 4.11.2 Refer to Specifications Section 01700 entitled PROJECT CLOSEOUT, for additional requirements for Record Drawings and Operating and Maintenance Manuals.

4.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- 4.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor, or any Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.
- 4.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.
- 4.12.3 Samples are physical examples, which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.
- 4.12.4 The Contractor shall review, approve and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the work of the Owner or any

separate contractor, all Shop Drawings, Product Data and Samples required by the Contract Documents.

- 4.12.5 By approving and submitting Shop Drawings, Product Data, and, Samples, the Contractor thereby represents that he has determined and verified all dimensions, quantities, field dimensions, relations to existing work, coordination with work to be installed later, coordination with information on previously accepted Shop Drawings, Product Data, or Samples and verification of compliance with all the requirements of the Contractor Documents. The accuracy of all such information is the responsibility of the Contractor. In reviewing Shop Drawings, Product Data, and Samples, the Architect shall be entitled to rely upon the Contractor's representation that such information is correct and accurate.
- 4.12.6 The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data or Samples under Article 2 unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submission and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples by the Architect's approval thereof.
- 4.12.7 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the Architect on previous submittals. Unless such written notice has been given, the Architect's approval of a resubmitted Shop Drawing, Product Data, or Sample shall not constitute approval of any changes not requested on the prior submittal.
- 4.12.8 No portion of the Work requiring submission of a Shop Drawing, Product Data or Sample shall be commenced until the submittal has been approved by the Architect as provided in Article 2. All such portions of the Work shall be in accordance with approved submittals.
- 4.12.9 Refer to Specifications Section 013000, SUBMITTALS, for additional requirements.

4.13 USE OF SITE

4.13.1 The right of possession of the premises and the improvements made thereon by the Contractor shall remain at all times in the Owner. The Contractor's right of entry and use thereof arises solely from the permission granted by the Owner under the Contract Documents. The Contractor shall confine his apparatus; the storage of materials and the operations of his workmen to limits indicated by law, ordinances, the Contract Documents and permits and/or directions by the Architect and shall not unreasonably encumber the premises with his materials.

4.14 CUTTING AND PATCHING WORK

- 4.14.1 The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work or to make its several parts fit together properly.
- 4.14.2 The Contractor shall not damage or endanger any portion of the Work or the work of the Owner or any separate contractors by cutting, patching or otherwise altering any work, or

by excavation. The Contractor shall not cut or otherwise alter the work of the Owner or any separate contractor except with the written consent of the Owner and of such separate contractor. The Contractor shall not unreasonably withhold from the Owner or any separate contractor his consent to cutting or otherwise altering the Work.

4.15 CLEANING UP

- 4.15.1 The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of the Work he shall remove all his waste materials and rubbish from and about the Project as well as all his tools, construction equipment, machinery and surplus materials. Immediately prior to the Architect's inspection for Substantial Completion, the Contractor shall completely clean the premises.
- 4.15.2 If the Contractor fails to maintain a clean site, free of accumulation of waste, rubbish and materials, the Owner may do so after twenty-four hour notification in accordance with Article 3 and the cost there of shall be charged to the Contractor.
- 4.15.3 If the Contractor fails to clean up at the completion of the Work, the Owner may do so as provided in Article 3 and the cost thereof shall be charged to the Contractor. Refer to Specifications Section 017000, PROJECT CLOSEOUT, for additional requirements.

4.16 COMMUNICATIONS

4.16.1 The Contractor shall forward all communications to the Owner through the Architect. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall communicate through the Architect. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with other Owner's contractors shall be through the Architect.

4.17 ROYALTIES AND PATENTS

4.17.1 The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof, except that the Architect shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified, but if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Architect.

4.18 INDEMNIFICATION

4.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Architect and their agents and employees from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of; or resulting from the performance of the Work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting there from and (2) is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. 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 4.

- 4.18.2 In any and all claims against the Architect or any of his agents or employees, by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Article 4 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 Contractor or any Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.
- 4.18.3 The obligations of the Contractor under this Article 4 shall not extend to the liability of the Architect, his agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the Architect, his agents or employees provided, such giving or failure to give is the primary cause of the injury or damage.

ARTICLE 5 - SUBCONTRACTOR

5.1 **DEFINITION**

- 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform any of the Work at the site and as further defined by M.G.L. Chapter 30, Section 39F(3). The term Subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Subcontractor or his authorized representative. The term Subcontractor does not include any separate contractor or his subcontractors.
- 5.1.2 A Sub-subcontractor is a person or entity that has a direct or indirect contact with a Subcontractor to perform any of the Work at the site. The term Sub-subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Sub-subcontractor or an authorized representative thereof.

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 Unless otherwise required by the Contract Documents or the Bidding Documents, the Contractor, as soon as practicable after the award of the Contract, shall furnish to the Owner and the Architect, in writing, the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner or Architect to reply promptly shall constitute notice of no reasonable objection.

- 5.2.2 The Contractor shall not contract with any such proposed person or entity to which the Owner or the Architect has made reasonable objection under the provisions of Article 5. The Contractor shall not be required to contract with anyone to whom he has a reasonable objection.
- 5.2.3 If the Owner or the Architect has reasonable objection to any such proposed person or entity, the Contractor shall submit a substitute to whom the Owner or the Architect has no reasonable objection, and the Contract Sum shall be increased or decreased by the difference in cost occasioned by such substitution and an appropriate Change Order shall be issued; however, no increase in the Contract Sum shall be allowed for any such substitution unless the Contractor has acted promptly and responsively in submitting names as required by Article 5.
- 5.2.4 The Contractor shall make no substitution for any Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 By an appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the Owner and the Architect. Said agreement shall preserve and protect the rights of the Owner and the Architect 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 allow to the Subcontractor, unless specifically provided otherwise in the Contractor-Subcontractor agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with his Subsubcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Article 5, and identify to the Subcontractor any terms and conditions of the proposed Subcontract which may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of such Documents available to his Sub-subcontractors.

ARTICLE 6 - WORK BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM WORK AND TO AWARD SEPARATE CONTRACTS

6.1.1 The Owner reserves the right to perform work related to the Project with his own forces, and to award separate contracts in connection with other portions of the Project or other work on the site under these or similar Conditions of the Contract. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, he shall make such claim as provided elsewhere in the Contract Documents.

- 6.1.2 When separate contracts are awarded for different portions of the Project or other work on the site, the term Contractor in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.
- 6.1.3 The Owner will provide for the coordination of the work of his own forces and of each separate contractor with the Work of the Contractor, who shall cooperate therewith as provided in Article 6.
- 6.1.4 The General Contractor shall permit the Owner to place and install as much equipment during the progress of the work as is possible before the completion of the various parts of the work, and agrees that such placing and the installation of equipment shall not in any way evidence the completion of the work or any portion of it, nor shall it signify the Owner's completion of the work or any portion thereof.

6.2 MUTUAL RESPONSIBILITY

- 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work, and shall connect and coordinate his Work with theirs as required by the Contract Documents.
- 6.2.2 If any part of the Contractor's Work depends for proper execution or results upon the work of the Owner or any separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Architect any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acceptance of the Owner's or separate contractors' work as fit and proper to receive his Work, except as to defects, which may subsequently become apparent in such work by others.
- 6.2.3 Any costs caused by defective or ill-timed work shall be borne by the party responsible therefore.
- 6.2.4 Should the Contractor wrongfully cause damage to the work or property of the Owner, or to other work on the site, the Contractor shall promptly remedy such damages as provided in Article 10.
- 6.2.5 Should the Contractor wrongfully cause damage to the work or property of any separate contractor, the Contractor shall upon due notice promptly attempt to settle with such other contractor by agreement, or otherwise to resolve the dispute. If such separate contractor sues the Owner on account of any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor.

6.3 OWNER'S RIGHT TO CLEAN UP

6.3.1 If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up as required by Article 4, the Owner may clean up and charge the cost thereof to the contractors responsible therefore as the Architect shall determine to be just.

ARTICLE 7 - MISCELLANEOUS PROVISIONS

7.1 GOVERNING LAW

7.1.1 The law of the Commonwealth of Massachusetts shall govern the Contract.

7.2 SUCCESSORS AND ASSIGNS

- 7.2.1 The Owner and the Contractor each binds himself, his partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party with respect to all covenants, agreements, and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other, nor shall the Contractor assign any moneys due or to become due to him hereunder, without the previous written consent of the Owner.
- 7.2.2 If, after making final payment, the Owner conveys to a third party any building or other improvement constructed under the Contract, any rights with respect to the property so conveyed which the Owner may have against the Contractor under Article 13 or by virtue of claims which, under the terms of Article 9, are reserved to the Owner after the making and acceptance of final payment, shall automatically transfer to such third party.

7.3 WRITTEN NOTICE

7.3.1 Written notice shall be deemed to have been duly served if delivered in person to an authorized representative of the person or entity for whom it was intended, or if delivered at or sent by registered or certified mail to the address of such person or entity set forth in the Agreement or in a subsequent written notice or by other means as specified in the Contract Documents.

7.4 CONSENT OR WAIVER

7.4.1 No consent or waiver, express or implied, by the Owner or the Architect to, or of, any breach of any covenant, condition or duty of the Contractor shall be construed as a consent to or waiver of any other breach of the same or any other covenant, condition or duty.

7.5 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

7.5.1 The Owner shall have the right to require the Contractor to furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising there under if and as required in the Bidding Documents or in the Contract Documents.

7.6 **RIGHTS AND REMEDIES**

7.6.1 The duties and obligations imposed by the Contract Documents and the rights and remedies available there under shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.

7.7 TESTS

- 7.7.1 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested or approved, the Contractor shall give the Architect timely notice of its readiness so the Architect may observe such inspection, testing or approval. The Contractor shall bear all costs of such inspections, tests or approvals conducted by public authorities. Unless otherwise provided, the Owner shall bear all costs of other inspections, tests or approvals.
- 7.7.2 If the Architect determines that any Work requires special inspection, testing, or approval which Article 7 does not include, he will, upon written authorization from the Owner, instruct the Contractor to order such special inspection, testing or approval, and the Contractor shall give notice as provided in Article 7. If such special inspection or testing reveals a failure of the Work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Architect's additional services made necessary by such failure, otherwise the Owner shall bear such costs, and an appropriate Change Order shall be issued.
- 7.7.3 The Contractor shall obtain and deliver promptly to the Architect any occupancy permit or any certificates of final inspection of any part of his work or operating permits for any mechanical apparatus, such as elevators, escalators, boilers, air compressors, etc., which may be required by law to permit full use and occupancy of the premises by the Owner. Receipt of such permits or certificates by the Architect shall be a condition precedent to Substantial Completion of the Work.

ARTICLE 8 - TIME

8.1 **DEFINITIONS**

- 8.1.1 Unless otherwise provided, the Contract Time is the period of time allotted in the Contract Documents for Substantial Completion of the Work as defined in Article 8, including authorized adjustments thereto.
- 8.1.2 The Date of Commencement of the Work is the date of the execution of the Owner-Contractor Agreement. The Contractor shall not commence Work on the site until the Architect issues a Notice to Proceed.
- 8.1.3 The Date of Substantial Completion of the Work or designated portion thereof is the date certified by the Architect when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy or utilize the Work or designated portion thereof for the use for which it is intended and only minor items which can be corrected or completed without substantial interference with the Owner's use of the Work remain to be corrected or completed. The Date of Substantial Completion shall be on or after the date of issuance of a Certificate of Occupancy as defined in 780 CMR for the Work without reservations or conditions by the Building Official.
- 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically designated.

8.1.5 The term "working day" shall mean any calendar day except Saturdays, Sundays, and legal holidays at the place of the building.

8.2 **PROGRESS AND COMPLETION**

- 8.2.1 All time limits stated in the Contract Documents are of the essence to the Contract.
- 8.2.2 The Contractor shall begin the Work on the date of commencement as defined in Article8. He shall carry the Work forward expeditiously with adequate forces and shall achieveSubstantial Completion within the Contract Time.
- 8.2.3 Within two (2) weeks after award of the Contract, the Contractor shall submit to the Architect a Progress Schedule showing for each class of work included in the Schedule of Values, the percentage completion to be obtained and the total dollar value of work to be completed as of the first of each month until Substantial Completion. All calculations shall be on the basis of work in place, but not including the value of materials delivered but not in place.
- 8.2.4 The Progress Schedule shall be based on an orderly progression of the Work, allowing adequate time for each operation, and leading to a reasonable certainty of Substantial Completion by the date established in the Agreement. The Progress Schedule will be reviewed by the Architect for compliance with the requirements of this Article and will be accepted by him or returned to the Contractor for revision and resubmittal. Unless specifically required by law, no payment under this Contract shall be due until the Progress Schedule has been approved by the Architect.
- 8.2.5 If in any Application for Payment the total value of the completed Work in place, as certified by the Architect, is less than 90% of the total value of the Work in place estimated in the Progress Schedule, the Owner may, at his option, require the Contractor to accelerate the progress of the Work without cost to the Owner by increasing the work force or hours of work, or by other reasonable means approved by the Architect.
- 8.2.6 If each of three (3) successive applications, as certified by the Architect, indicate that the actual work completed is less than 90% of the values estimated in the Progress Schedule to be completed by the respective dates, the Owner may at his option, treat the Contractor's delinquency as a default justifying the action permitted under Article 13 of the document entitled CONTRACT, included elsewhere in the Contract Documents.
- 8.2.7 If the Architect has determined that the Contractor should be permitted to extend the time for completion, as provided in Paragraph 8.3, the calendar dates in the Progress Schedule shall be adjusted accordingly to retain their same relationship to the adjusted Date of Substantial Completion, and the dollar value of work to be completed as of the first of each month shall be adjusted pro-rata.
- 8.2.8 If the Contractor fails to submit any Application for Payment in any month, the Architect shall, for the purpose of this evaluation of progress, certify separately to the actual value of the work in place and completed as of the first of the month, to the best of his knowledge.

8.2.9 Nothing herein shall limit the Owner's right to liquidated or other damages for delays by the Contractor or to any other remedy which he may possess under other provisions of the Contract Documents or by law.

8.3 DELAYS AND EXTENSIONS OF TIME

- 8.3.1 Any delay and subsequent request for an extension of time shall be governed by M.G.L. Chapter 30, Section 39(O) and the Owner-Contractor Agreement.
- 8.3.2 No work shall be suspended without the written permission of the Owner or his representative.
- 8.3.3 If no agreement is made stating the dates upon which interpretations as provided in Article 2 shall be furnished, then no claim for delay shall be allowed on account of failure to furnish such interpretations until thirty (30) days after written request is made for them, and not unless such claim is reasonable.
- 8.3.4 This Article 8 does not exclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the Owner-Contractor Agreement and, including authorized adjustments thereto, is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents.

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Architect a Schedule of Values allocated to the various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Architect may require and shall be revised if later found by the Architect to be inaccurate. This schedule, unless object to by the Architect, shall be used only as a basis for the Contractor's Application for Payment.

9.3 APPLICATIONS FOR PAYMENT

- 9.3.1 In accordance with Section 01027 of the Specifications, the Contractor shall submit to the Architect an itemized Application for Payment, notarized and supported by such data substantiating the Contractor's right to payment as the Owner or the Architect may require, and reflecting retainage, if any, as provided in Supplemental General Conditions, Article I. The format and number of copies of such Applications for Payment shall be as noted in Section 010270.
- 9.3.2 Unless otherwise provided in the Contract Documents, payments will be made on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the site and, if approved in advance by the Owner, payments may similarly be made for materials or equipment suitably stored at some other location

agreed upon in writing. Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest, including applicable insurance and transportation to the site for those materials and equipment stored off the site. The Contractor shall reimburse the Owner for any loss or damage to such unincorporated materials or equipment not covered by insurance.

- 9.3.3 The Contractor warrants that title to all Work, materials and equipment covered by an Application for Payment will pass to the Owner either by incorporation in the construction or upon the receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in this Article 9 as "liens". The Contractor further agrees that the submission of any Application for Payment shall conclusively be deemed to waive all liens with respect to said work, materials and labor to which the Contractor then may be entitled; provided, however, that in no event shall such waiver of lien rights waive right to payment for said Work, materials and labor.
- 9.3.4 Each Application for Payment or periodic estimate requesting payment must be accompanied by a certificate from each Subcontractor stating that he has been paid all amounts due him on the basis of the previous periodic payment to the Contractor, or else stating the amount not so paid and the reason for the discrepancy. In the event, of any such discrepancy, the Contractor shall be required to furnish his own written explanation. See Section 01027.

9.4 CERTIFICATES FOR PAYMENT

- 9.4.1 The Architect will, within seven (7) days after the receipt of the Contractor's Application for Payment, either issue a Certificate for Payment to the Owner, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor in writing his reasons for withholding a Certificate as provided in Article 9.
- 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on his observations at the site as provided in Article 2 and the data comprising the Application for Payment, that the Work has progressed to the point indicated; that, to the best of his knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to the results of any subsequent tests required by or performed under the Contract Documents, to minor deviations from the Contract Documents correctable prior to completion, and to any specific qualifications stated in his Certificate); and that the Contractor is entitled to payment in the amount certified. However, by certifying a Certificate for Payment, the Architect shall not thereby be deemed to represent that he has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work or that he has reviewed the construction means, methods, techniques, sequences or procedures, or that he has made any examination to ascertain how or for what purpose the Contractor has used the moneys previously paid on account of the Contract.

9.5 **PROGRESS PAYMENTS**

- 9.5.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents. The Owner retains the right to modify the amount of payment certified by the Architect. Reasons for modification shall be described in writing to the Architect and Contractor.
- 9.5.2 The Contractor shall promptly pay each Subcontractor upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's Work, the amount to which said Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contractor on account of such Subcontractor's Work. The Contractor shall, by an appropriate agreement with each Subcontractor, require each Subcontractor to make payments to his Sub-subcontractors in similar manner.
- 9.5.3 The Architect may, on request and at his discretion, furnish to any Subcontractor, if practicable, information regarding the percentages of completion or the amounts applied for by the Contractor and the action taken thereon by the Architect on account of Work done by such Subcontractor.
- 9.5.4 Neither the Owner nor the Architect shall have any obligation to pay or to see the payment of any moneys to any Subcontractor except as may otherwise be required by law.
- 9.5.5 No Certificate for a progress payment, nor any progress payment, nor any partial or entire use or occupancy of the Project by the Owner, shall constitute an acceptance of any Work not in accordance with the Contract Documents.

9.6 PAYMENTS WITHHELD

- 9.6.1 The Architect may decline to certify payment and may withhold his Certificate in whole or in part, to the extent reasonably necessary to protect the Owner, if in his opinion he is unable to make representations to the Owner as provided in Article 9. If the Architect is unable to make representations to the Owner as provided in Article 9 and to certify payment in the amount of the Application, he will notify the contractor as provided in Article 9. If the Contractor and the Architect cannot agree on a revised amount, the Architect will promptly certify a Certificate for Payment for the amount for which he is able to make such representations to the Owner. The Architect may also decline to certify payment or because of subsequently discovered evidence or subsequent observations, he may nullify the whole or any part of any Certificate for Payment previously issued, to such extent as may be necessary in his opinion to protect the Owner from loss because of:
 - (1) Defective Work not remedied,
 - (2) Third party claims filed or reasonable evidence indicating probable filing of such claims,
 - (3) Failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment,
 - (4) Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum,

- (5) Damage to the Owner,
- (6) Reasonable evidence that the Work will not be completed within the Contract Time or
- (7) Persistent failure to carry out the Work in accordance with the Contract Documents, or
- (8) Failure of mechanical trades or electrical trades subcontractors to comply with mandatory requirements for maintaining record drawings. The Contractor shall be required to check record drawings each month. The Architect shall require written confirmation that the record drawings are "up-to-date" before approval of the Contractor's monthly payment requisition will be considered.
- 9.6.2 When the above grounds in Article 9 are removed, payment shall be made for amounts withheld because of them.

9.7 FAILURE OF PAYMENT

9.7.1 If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven (7) days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor as required by the Contract Documents any amount certified by the Architect, then the Contractor may, upon seven (7) additional days written notice to the Owner and the Architect, stop the Work until payment of the amount owing has been received.

9.8 SUBSTANTIAL COMPLETION

- When the Contractor considers that the Work, or a portion thereof designated in the 9.8.1 Contract Documents for separate completion, is substantially complete as defined in Article 8, the Contractor shall submit to the Architect (1) a list of items to be completed or corrected, and (2) all special warranties required by the Contract Documents endorsed by the Contractor and in a form reasonably acceptable to the Architect. The failure to include any items on the list mentioned in the preceding sentence does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Architect on the basis of an inspection determines that the Work or designed portion thereof is substantially complete, and when the Contractor has submitted to the Architect the special warranties, as provided in the first sentence of this subparagraph, the Architect will then certify a Certificate of Substantial Completion which shall establish the Date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the Date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and the Contractor for their written acceptance of the responsibilities assigned to them in such Certificate.
- 9.8.2 Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and certification by the Architect, the Owner shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof, as provided in the Contract Documents.

9.9 FINAL COMPLETION AND FINAL PAYMENT

- 9.9.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when he finds the Work acceptable under the Contract Documents and the Contract fully performed, he will promptly certify a final Certificate of Payment stating that to the best of his knowledge, information and belief, and on the basis of his observations and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor, and noted in said final Certificate, is due and payable. The Architect's final Certificate for Payment will constitute a further representation that the conditions precedent to the Contractor's being entitled to final payment as set forth in Article 9 have been fulfilled.
- 9.9.2 Unless otherwise required by applicable law, neither the final payment nor the remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or his property might in any way be responsible, have been paid or otherwise satisfied, (2) consent of surety, if any, to final payment and (3), if required by the Owner, other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of liens, arising out of the Contract, to the extent and in such form as may be designated by the Owner. If the Contractor fails to furnish such releases or waivers as the Owner may requires satisfying the Owner that there are not outstanding claims, the Owner may require the Contractor, as a condition of final payment, to furnish a bond satisfactory to the Owner to indemnify the Owner against any such claims.
- 9.9.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by the issuance of Change Orders affecting final completion, and the Architect so confirms, the Owners shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than the retainage stipulated in the Contract Documents, and if bonds have been furnished as provided in Article 7, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.
- 9.9.4 The making of final payment shall constitute a waiver of all claims by the Owner except those arising from: (1) unsettled claims under the Bonds required elsewhere in the Contract Documents, (2) faulty or defective Work appearing after Substantial Completion, (3) failure of the Work to comply with the requirements of the Contract Documents, or (4) terms of any special warranties required by the Contract Documents.
- 9.9.5 The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the final Application for Payment.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work.

10.2 SAFETY OF PERSONS AND PROPERTY

- 10.2.1 The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to: (1) all employees on the Work and all other persons who may be affected thereby; (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 Contractor or any of his Subcontractors or Subsubcontractors; and (3) other neighboring property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.
- 10.2.2 The Contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the safety of persons or property or their protection from damage, injury or loss.
- 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.
- 10.2.4 When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.
- 10.2.5 The Contractor shall promptly remedy all damage or loss (other than damage or loss insured under Article 11) to any property referred to in Article 10 caused in whole or in part by the Contractor, any Subcontractor, any Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone whose acts any of them may be liable and for which the Contractor is responsible under Article 10 except damage or loss attributable to the acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either by of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to his obligations under Article 4.
- 10.2.6 The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and the Architect.
- 10.2.7 The Contractor shall not load or permit any part of the Work to be loaded so as to endanger its safety.

10.3 EMERGENCIES

10.3.1 In any emergency affecting the safety of persons or property, the Contractor shall act, at his discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in Article 12 for the Changes in the Work.

ARTICLE 11 - INSURANCE

11.1 CONTRACTOR'S LIABILITY INSURANCE

- 11.1.1 The Contractor shall purchase and maintain in a company or companies to which the Owner has no reasonable objection, such insurance as will protect him from claims set forth below which may arise out of or result from the Contractor's operations under the Contract, whether such operations be by himself or by any Subcontractor or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:
 - (1) Workmen's Compensation Massachusetts Statutory / Employers Liability
 - (2) Commercial Liability- Per Occurrence / Aggregate \$1,000,000 / \$2,000,000

(3) Automobile Liability/Combined Single Limit - \$2,000,000 (all owned, hired and non-owned autos).

- (4) Excess / Umbrella Liability –\$2,000,000
- (5) Independent Contractors -Same limits as above

(6) Products and Completed Operations -Same limits as above commencing with issuance of final Certificate of Payment.

(7) Contractual Liability - Same limits as above.

- 11.1.2 The insurance required by Article 11 shall include all major divisions of coverage, and shall be on a comprehensive general basis including Premises and Operations (including X-C-U), Owner's and Contractor's Protective Products and Completed Operations, and Owned, Non-owned, and Hired Motor Vehicles. Such insurance shall be written for not less than any limits of liability required by law or those set forth below, whichever is greater.
 - (1) Workmen's Compensation -Statutory/Employers Liability
 - (2) Commercial Liability Per Occurrence / Aggregate \$1,000,000.00 / 2,000,000.00
 - (3) Automobile Liability/Combined Single Limit \$2,000,000.00 (all owned, hired and non-owned autos).
 - (4) Excess / Umbrella Liability \$2,000,000.00
 - (5) Independent Contractors -Same limits as above
 - (6) Products and Completed Operations -Same limits as above commencing with issuance of final Certificate of Payment
 - (7) Contractual Liability Same limits as above
- 11.1.3 The insurance required by Article 11 shall include contractual liability insurance applicable to the Contractor's obligations under Article 4.
- 11.1.4 Certificates of Insurance acceptable to the Owner shall be filed with the Owner. These Certificates shall contain a provision that coverage afforded under the policies will not be canceled until at least thirty (30) days prior written notice has been given to the Owner.

11.1.5 These certificates shall set forth evidence of all coverage required by Article 11. The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending limits of coverage.

11.2 OWNER'S LIABILITY INSURANCE

11.2.1 The Owner shall be responsible for maintaining his own liability insurance and, at his option, may purchase and maintain such insurance as will protect him against claims, which may arise from operations under the Contract.

11.3 PROPERTY INSURANCE

- 11.3.1 The Contractor shall purchase and maintain property insurance upon the entire Work at the site as provided above in Article 11. This insurance shall include the interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work and shall include "all risk" insurance for physical loss or damage including, without duplication of coverage, theft, vandalism and malicious mischief.
- 11.3.2 The Owner shall purchase and maintain such boiler and machinery insurance as may be required by the Contract Documents or by law. This insurance shall include the interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Work.
- 11.3.3 Any loss insured under Article 11 is to be adjusted with the Contractor and made payable to the Contractor as trustee for the insureds, as their interests may appear, subject to the requirements of any applicable mortgagee clause and of Subparagraph.
- 11.3.4 The Contractor shall pay each Subcontractor a just share of any insurance moneys received by the Contractor, and by appropriate agreement, written where legally required for validity, shall require each Subcontractor to make payments to his Sub-subcontractors in similar manner.
- 11.3.5 The Contractor shall file a copy of all policies with the Owner before an exposure to loss may occur. All property insurance shall remain in effect until the date of final completion or the date Premises/Property in put in service by the Owner, whichever is earlier.
- 11.3.6 The Owner and Contractor waive all rights against (1) each other and the Subcontractors, Sub-subcontractors, agents and employees each of the other, and (2) the Architect and separate contractors, if any, and their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other perils to the extent covered by insurance obtained pursuant to this Article 11 or any other property insurance applicable to the Work, except such rights as they may have to the proceeds of such insurance held by the Contractor as trustee. The foregoing waiver afforded the Architect, his agents and employees shall not extend to the liability imposed by Article 4. The Owner or the Contractor, as appropriate, shall require of the Architect, separate contractors, Subcontractors, and Sub-subcontractors by appropriate agreements, written where legally required for validity, similar waivers each in favor of all other parties enumerated in this Article 11.

- 11.3.7 If required in writing by any party in interest, the Contractor as trustee shall, upon the occurrence of an insured loss, give bond for the proper performance of his duties. He shall deposit in a separate account any money so received, and he shall distribute it in accordance with the direction of a court of competent jurisdiction.
- 11.3.8 The Contractor as trustee shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within five days after the occurrence of loss to the Contractor's exercise of this power. If such objection were made, the Contractor as trustee shall make settlement with the insurers in accordance with the direction of a court of competent jurisdiction.

11.4 LOSS OF USE INSURANCE

11.4.1 The Owner, at his option, may purchase and maintain such insurance as will insure him against loss of use of his property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of his property including consequential losses due to fire or other hazards however caused, to the extent covered by insurance under this Article 11.

ARTICLE 12 - CHANGES IN THE WORK

12.1 CHANGE ORDERS

- 12.1.1 The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and the Contract Time being adjusted accordingly. All such changes in the Work shall be authorized by Change Order, and shall be performed under the applicable conditions of the Contract Documents.
- 12.1.2 A Change Order is a written order to the Contractor signed by the Owner and the Architect, issued after execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Sum or the Contract Time. Only Change Orders may change the Contract Sum and the Contract Time. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract Sum or the Contract Time.
- **12.1.3** If the Contractor does not agree with the terms of the Change Order, the Contractor shall return the unsigned Change Order to the Owner. In such event, the Work, Contract Sum and/or Contract Time shall be adjusted as reflected in the Change Order, subject to the Contractor's rights under M.G.L. Chapter 30, Section 39J, but in no event shall the Contractor refuse to perform the Work as modified by the Change Order.

12.2 CLAIMS FOR ADDITIONAL COST

12.2.1 If the Contractor claims that any instructions or orders, whether oral, written, or drawings, or otherwise, involve extra cost or time, and such instructions or orders are not accompanied by a written acknowledgment by the Owner and Architect that extra payment will be made or time extended, he shall promptly so notify the Architect in writing and shall not proceed with the work until he has received a further written order

to proceed, except, as provided in Article 10, in the case of an emergency affecting life or property.

- 12.2.2 Upon receipt from the Contractor of a written notice of claim as provided in Article 12, the Architect shall review such claim and if he determines that any work in dispute should proceed, he shall issue to the Contractor a written order, signed by the Owner, (1) to proceed in which he shall approve or deny the Contractor's claim, in whole or in part, or (2) to proceed subject to a later determination by the Architect of the Contractor's right to extra payment.
- 12.2.3 To the extent that the Architect, when issuing the written order to proceed described in Article 12, approves the contractor's claim, Change Order shall adjust the Contract Sum and/or Contract Time. If the Architect, when issuing his written order to proceed, denies, in whole or in part, the Contractor's claim, the Contractor shall proceed with the work without delay, subject to the Contractor's rights under M.G.L. Chapter 30, Section 39(J). If the Architect, when issuing his written order to proceed, instructs the Contractor to proceed with the work subject to a later determination by the Architect of the Contractor's right to extra payment or time, the Contractor shall proceed with the Work without delay or impact to the schedule.
- 12.2.4 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 Contractor, 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 therefrom.
- 12.2.5 Time Limits on Claims: Claims by the Contractor must be made within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be made by written notice. An additional Claim made after the initial Claim has been implemented by Change Order will not be considered unless submitted in a timely manner.

12.3 MINOR CHANGES IN THE WORK

12.3.1 The Architect shall have the authority to order minor changes in the Work that do not involve an adjustment in the Contract Sum or an extension of the Contract Time, and are not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order, and shall be binding on the Owner and the Contractor. The Contractor shall carry out such written orders promptly without delay or impact to the schedule.

12.4 EQUITABLE ADJUSTMENTS

- 12.4.1 Equitable adjustments in the Contract Sum shall be determined according to one of the following methods, or a combination thereof; as determined by the Owner:
 - (1) fixed price basis, provided that the price shall be inclusive of items 3(a) through 3(d), 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 adjustments.
- time and materials basis, based upon a not to exceed, predetermined upset amount to be subsequently adjusted on the basis of actual costs comprised of items (a) through (d) below:
 - (a) the costs at prevailing rates for direct labor, material and use of equipment;
 - (b) plus, the costs of Workmen's Compensation Insurance, Liability Insurance, Federal Social Security and Massachusetts Unemployment Compensation; or as an alternative, the Contractor may elect to add a flat twenty-five (25%) percent to the total labor rate in (a), above;
 - (c) plus, ten (10) percent of (a), above, for overhead, superintendence and profit which will be paid to the Contractor for the work of the Contractor and all his subcontractors. The contracting parties referred to in this subparagraph shall agree upon the distribution of the ten (10) percent as a matter of contract between each other;
 - (d) plus actual direct premium costs of payment and performance bonds required of the Contractor provided there would be an appropriate credit for premiums for a credit change order.

12.4.2 If the net change is an addition to the Contract Sum, it shall include the Contractor's overhead, superintendence and profit. On any change that involves a net credit, no allowance for overhead superintendence and profit shall be figured. For any change that does not include labor performed or materials installed in the Project, there will be no markup for the contractor's overhead, superintendence, and profit, notwithstanding any net increase in the Contract Sum. Charges for small tools known as "tools of the trade" are not to be computed in the amount of an equitable change.

ARTICLE 13 - UNCOVERING AND CORRECTION OF WORK

13.1 UNCOVERING OF WORK

- 13.1.1 If any portion of the Work should be covered contrary to the request of the Architect or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect, be uncovered for his observation and shall be replaced at the Contractor's expense.
- 13.1.2 If any other portion of the Work has been covered which the Architect has not specifically requested to observe prior to being covered, the Architect, with the approval of the Owner, may request to see such Work and it shall be uncovered by the Contractor. If such Work is found in accordance with the Contract Documents, appropriate Change Order shall charge the cost of uncovering and replacement charged to the Owner. If such Work is found not in accordance with the Contract Documents, the Contractor shall pay such costs unless it is found that this condition was caused by the Owner or a separate contractor as provided in Article 6, in which event the Owner shall be responsible.

13.2 CORRECTION OF WORK

13.2.1 The Contractor shall promptly correct all Work rejected by the Architect as defective or as failing to conform to the Contract Documents whether observed before or after

Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work, including compensation for the Architect's additional services made necessary thereby and any costs, loss, or damages to the Owner resulting from such failure or defect.

- 13.2.2 If, within one (1) year after the Date of Substantial Completion of the Work or designated portion thereof or within one (1) year after acceptance by the Owner of designated equipment or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. This obligation shall survive termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.
- 13.2.3 The Contractor shall remove from the site all portions of the Work which are defective or non-conforming and which have not been corrected under Articles 4 and 13, unless the Owner waives removal.
- 13.2.4 If the Contractor fails to correct defective or non-conforming Work as provided in Articles 4 and 13, the Owner may correct it in accordance with Article 3.
- 13.2.5 If the Contractor does not proceed with the correction of such defective or nonconforming Work within a reasonable time fixed by written notice from the Architect, the Owner may remove it and may store the materials or equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten (10) days thereafter, the Owner may upon ten (10) additional days written notice, sell such Work at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for the Architect's additional services made necessary thereby. If such proceeds of sale do not cover all costs, which the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.
- 13.2.6 The Contractor shall bear the cost of making good all work of the Owner or separate contractors destroyed or damaged by such correction or removal.
- 13.2.7 Nothing contained in this Article 13 shall be construed to establish a period of limitation with respect to any other obligation, which the Contractor might have under the Contract Documents, including Article 4 hereof. The establishment of the time period of one (1) year after the Date of Substantial Completion or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which his obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to his obligations other than specifically to correct the Work.

13.3 ACCEPTANCE OF DEFECTIVE OR NON-CONFORMING WORK

13.3.1 If the Owner prefers to accept defective or non-conforming Work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect a reduction in the Contract Sum where appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

END OF SECTION

SUPPLEMENTARY GENERAL CONDITIONS – PART I

STATUTORY PROVISIONS FOR MASSACHUSETTS PUBLIC CONSTRUCTION CONTRACTS CONTENTS

| <u>Paragraph</u> | <u>Subject</u> | Statute or Executive Order | | |
|--|---|--------------------------------------|--|--|
| ARTICLE 1 – PAYMENT, CONTRACT ADMINISTRATION, ETC. | | | | |
| 1.1 | "or Equal" Clause | M.G.L. Chapter 30, Section 39M(b) | | |
| 1.2 | Delays | M.G.L. Chapter 30, Section 39O | | |
| 1.3 | Deviations | M.G.L. Chapter 30, Section 39I | | |
| 1.4 | Finality of Decisions | M.G.L. Chapter 30, Section 39J | | |
| 1.5 | Differing Site Conditions | M.G.L. Chapter 30, Section 39N | | |
| 1.6 | Timely Decisions | M.G.L. Chapter 30, Section 39P | | |
| 1.7 | Certificate of Appropriation | M.G.L. Chapter 44, Section 31C | | |
| 1.8 | Method of Payment (Public Building Projects) | M.G.L. Chapter 30, Section 39K | | |
| 1.9 | Method of Payment (Public Works Projects) | M.G.L. Chapter 30, Section 39G | | |
| 1.10 | Direct Payment | M.G.L. Chapter 30, Section 39F | | |
| 1.11 | Discharge or Release of Bonds | M.G.L. Chapter 30, Section 40 | | |

ARTICLE 2 – WAGES AND EMPLOYMENT PRACTICES

| 2.1 | Preference to Veterans and Citizens | M.G.L. Chapter 149, Section 26 | | |
|---|--|--|--|--|
| 2.2 | Determination of Wage Rates | M.G.L. Chapter 149, Section 27 | | |
| 2.3 | Employment Records | M.G.L. Chapter 149, Section 27B | | |
| 2.4 | Wages Paid to Operators of Trucks and Other Equipment | M.G.L. Chapter 149, Section 37F | | |
| 2.5 | Reserve Police Officers | M.G.L. Chapter 149, Section 34B | | |
| 2.6 | Eight-hour Day, etc. | M.G.L. Chapter 149, Sections 30 and 34 | | |
| 2.7 | Lodging, etc. | M.G.L. Chapter 149, Section 25 | | |
| 2.8 | Access to Contractor's Records | Executive Order No. 195 | | |
| 2.9 | Worker's Compensation | M.G.L. Chapter 149, Section 34A | | |
| ARTICLE 3 – CONTRACTOR'S ACCOUNTING METHODS | | | | |
| 3.1-3.5 | Contractor's Accounting Method Requirements | M.G.L. Chapter 30, Section 39R | | |
| ARTICLE 4 – MISCELLANEOUS | | | | |
| 4.1 | Weather Protection | M.G.L. Chapter 149, Section 44F(1) | | |
| 4.2 | Form for Sub-Contract | M.G.L. Chapter 149, Section 44(F)(4)(c) | | |
| 4.3 | Foreign Corporations | M.G.L. Chapter 30, Section 39L | | |

REGIONAL EMERGENCY COMMUNICATIONS CENTER

| 4.4 | Shoring | M.G.L. Chapter 149, Section 129A |
|-----|---|---|
| 4.5 | Compliance with Tax Laws | M.G.L. Chapter 62C, Section 49A |
| 4.6 | Verification of Construction Debris Disposal | 2008 Worcester Revised Ordinances, Chapter 8, Section 7 |
| 4.7 | Responsible Employer Ordinance | 2008 Worcester Revised Ordinances, Chapter 2, Section 35 |
| 4.8 | Regulation of Construction Noise | 2008 Worcester Revised Ordinances, Chapter 8, Section 34 |
| 4.9 | Regulation of Excessive and Unreasonable Noise | 2008 Worcester Revised Ordinances, Chapter Nine, Section 1A(e)(9) |

SUPPLEMENTARY GENERAL CONDITIONS – PART I STATUTORY PROVISIONS FOR MASSACHUSETTS PUBLIC CONSTRUCTION CONTRACTS

The following provisions are required by or are intended to be consistent with requirements of Massachusetts statutes governing public construction contracts in the Commonwealth of Massachusetts (hereinafter referred 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 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 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 subject to 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.

Every such contract shall provide that an item equal to that named or described in the said specifications may be furnished. 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 awarding authority:

a. It is at least equal in quality, durability, appearance, strength, and design;

- b. it will perform at least equally the function imposed by the general design for the public work being contracted for or the material being purchased, and
- c. it conforms substantially, even with deviations, to the detailed requirements for the items as indicated by the specifications. For each item of material the specifications shall provide for either a minimum of three named brands of material or a description of material which can be met by a minimum of three manufacturers or producers, and for the equal of any one of said name or described materials.

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.

In the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the general contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the general 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 general contractor or the subcontractor may have against each other.

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.

(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.

1.3 Deviations: (Statutory referenced: 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.

The Contractor shall perform all the work required by this contract in conformity with the plans and specifications contained therein. No willful and substantial deviation from said plans 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 plans 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 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 therefor (2) that the specified deviation does not materially injure the project as a whole; (3) that either the work substituted for the work specified is the same cost and guality, 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.

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.

Whoever violates any provision of this section wilfully and with intent to defraud shall be punished by a fine of not more than five thousand dollars or by imprisonment for not more than six months, or both.

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.

Notwithstanding any contrary provision of this contract, a decision by the contracting body or by any administrative board, official or agency, or by any architect or engineer, on a dispute, whether of fact or of law, arising under said contract shall not 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 49, Sections 44A through 44H.

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 awarding 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 such a nature as to cause 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.

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.

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 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.

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.

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 such contract is available therefor and that an officer or agent 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 to be performed under a contract subject to this section, 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 have been 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 therefor: but such certificate shall not be construed 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 such contract or order is available shall bar any defense by the awarding authority on the ground of insufficient appropriation; and any law barring payment in excess of appropriations shall not apply to amounts covered by any certificate under this section.

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, or the amount set forth in M.G.L. Chapter 30, Section 39K.

1.8.1 Within fifteen 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, 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 Paragraph 1.10 of these Supplementary General Conditions, 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 Paragraph 1.10 of these Supplementary General Conditions, 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 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 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...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 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 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 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.

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 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 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 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 percent retainage on that work, including the quantity, price and all but one 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 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 therefor, whichever occurs first. The awarding authority shall include the amount of such interest in the substantial completion estimate.

1.9.4 Within fifteen 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 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 days' 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 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 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 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 therefor, 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. The awarding authority shall include the amount of the interest required to be paid hereunder in the final estimate.

1.9.6 The awarding authority shall pay the amount due pursuant to any substantial completion or final estimate within thirty-five 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 day to the day of payment. Within 15 days after receipt from the contractor, if such place is so designated by the awarding authority, if such place is so designated, of a periodic estimate requesting payment of the amount due for the preceding periodic estimate period, the awarding authority shall make a periodic payment to the contractor for the work performed during the preceding periodic estimate period 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 materials are free from all encumbrances. The awarding authority shall include with each such payment interest on the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting 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 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 section 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 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 44J, 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 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.

1.10.2 Not later than the sixty-fifth day after each Subcontractor substantially completes the work in accordance with the plans 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 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 barrings such payment and also less any amount claimed due from the Subcontractor by the General Contractor.

1.10.3 Each payment made by the awarding authority to the General 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 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 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 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 General 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 General 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 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 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 General Contractor and of the amount due for each claim made by the General Contractor against the Subcontractor.

1.10.5 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 payent 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 the Subparagraph 1.10.5 in an interestbearing 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 and the General Contractor and the Subcontractor of the date of the deposit and 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.

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 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 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 General 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 General Contractor.

1.10.9 If the Subcontractor does not receive payment as provided in Subparagraph 1.10.1 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 1.10.1, the Subcontractor may demand direct payment by following the procedure in Subparagraph 1.10.4 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 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 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 1.10.6

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.

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-44J, 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 General Contractor, (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 or both performing labor or both performing heat a person approved by the awarding authority in materials pursuant to a contract with the General 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.

1.10.12 A General 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 1.1.6 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 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 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 General 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. c.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 year from the time of completion, subject to Section 1.8, 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 therefor 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. c. 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 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, within such preference, preference shall be given to service-disabled veterans; 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, 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, authority or district, and within such preference, preference shall be given to service-disabled veterans.

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 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 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 in the private construction industry 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, authority 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 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 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, including the transportation of gravel or fill to the site of said public works or the removal of surplus gravel or fill from such site. The commissioner shall classify said jobs, and he may revise such classification 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. Each year after the awarding of the contract, the public official or public body shall submit to the commissioner a list of the jobs upon which mechanics and apprentices and laborers are to be employed and shall request that the commissioner update the determination of the rate of wages to be paid on each job. The general contractor shall annually obtain updated rates from the public official or public body and no contractor or subcontractor shall pay less than the rates so established. Said rates shall apply to all persons engaged in transporting gravel or fill to the site of said public works or removing gravel or fill

from such site, regardless of whether such persons are employed by a contractor or subcontractor or are independent contractors or owner-operators. The commissioner, subject to the provisions of Section 2.1, 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 official 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 and subsequent updates to be kept posted in a conspicuous place at the site of said works during the life of the contract. An apprentice performing work on a project subject to this section shall maintain in his possession an apprentice identification card issued pursuant to section M.G.L. Chapter 23, Section 11W. 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 said Section 2.1, 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 a 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. Whoever shall pay less than said rate or rates of wages, including payments to health and welfare funds and pension funds, or the equivalent payment in wages, on said works to any person performing work within classifications as determined by the commissioner, and whoever, for himself, or as representative, agent or officer of another, shall take or receive for his own use or the use of any other person, as a rebate, refund or gratuity, or in any other guise, any part or portion of the wages, including payments to health and welfare funds and pension funds, or the equivalent payment in wages, paid to any such person for work done or service rendered on said public works, shall have violated this section and shall be punished or shall be subject to a civil citation or order as provided in M.G.L. Chapter 149, Section 27C. The president and treasurer of a corporation and any officers or agents having the management of such corporation shall also be deemed to be employers of the employees of any corporation within the meaning of Sections 2.1 to 2.3, inclusive.

Offers of restitution or payment of restitution shall not be considered in imposing such punishment.

2.2.2 When an investigation by the attorney general's office reveals that a contractor or subcontractor has violated this section by failing to pay said rate or rates of wages, including payments to health and welfare funds and pension funds, or the equivalent payment in wages, on said works to any person performing work within classifications as determined by the commissioner, or that a contractor or

subcontractor has, for himself, or as representative, agent or officer of another, taken or received for his own use or the use of any other person, as a rebate, refund or gratuity, or in any other guise, any portion of the wages, including payments to health and welfare funds and pension funds, or the equivalent payment in wages, paid to any such person for work done or service rendered on said public works, the attorney general may, upon written notice to the contractor or subcontractor and the sureties of the contractor or subcontractor, and after a hearing thereon, order work halted on the part of the contractor has filed with the attorney general's office a bond in the amount of such penal sum as the attorney general shall determine, conditioned upon payment of said rate or rates of wages, including payments to health and welfare funds and pension funds, or the equivalent payment in wages, on said works to any person performing work within classifications as determined by the commissioner.

An employee claiming to be aggrieved by a violation of this section may, 90 days after the filing of a complaint with the attorney general, or sooner if the attorney general assents in writing, and within 3 years after the violation, institute and prosecute in his own name and on his own behalf, or for himself and for others similarly situated, a civil action for injunctive relief, for any damages incurred, and for any lost wages and other benefits. An employee so aggrieved who prevails in such an action shall be awarded treble damages, as liquidated damages, for any lost wages and other benefits and shall also be awarded the costs of the litigation and reasonable attorneys' fees.

2.3 Employment Records To Be Kept By Contractor, Subcontractors; Statement of Compliance: (Statutory reference: M.G.L. c. 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.

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 records of all mechanics and apprentices, teamsters, chauffeurs and laborers employed thereon, showing the name, address and occupational classification of each such employee on said works, and hours worked by, and wages paid to, each such employee, and shall promptly furnish to the Attorney General or his representative, upon his request, a copy of said record, signed by the employer or his authorized agent under the penalties of perjury. For every week in which an apprentice is employed by a contractor, subcontractor or public body subject to this section, a photocopy of the apprentice's apprentice identification card, issued pursuant to M.G.L. Chapter 23, Section 11W, shall be attached to the records submitted under this section. Such records shall be open to inspection by any authorized representative of the department at any reasonable time, and as often as may be necessary. Every contractor and subcontractor required to keep such a record shall submit a copy of said record to the awarding authority directly and on a weekly basis.

Each such Contractor, Subcontractor or public body shall preserve its payroll records for a period of three years from the date of completion of the contract.

Each such Contractor, Subcontractor or public body shall furnish to the awarding authority directly within fifteen 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 payme | ent of the persons employed by |
| (Contractor, Subcontractor or pub | lic 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 twenty-six and twenty-seven of chapter one hundred and forty-nine 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 awarding authority for such inspection and copying.

2.4 Wages Paid to Operators of Trucks and Other Equipment: (Statutory reference: M.G.L. c. 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.

No agreement of lease, rental or other arrangement, and no order or requisition under which a truck or any automotive or other vehicle or equipment is to be engaged in public works by the commonwealth or by a county, city, town or district, shall be entered into or given by any public official or public body unless said agreement, order or requisition contains a stipulation requiring prescribed

rates of wages, as determined by the commissioner, to be paid to the operators of said trucks, vehicles or equipment. Any such agreement, order or requisition which does not contain said stipulation shall be invalid, and no payment shall be made thereunder. Said rates of wages shall be requested of said commissioner by said public official or public body, and shall be furnished by the commissioner in a schedule containing the classifications of jobs, and the rate of wages 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. Whoever pays less than said rates of wages, including payments to health and welfare funds, or the equivalent in wages, on said works, and whoever accepts for his own use, or for the use of any other person, as a rebate, gratuity or in any other guise, any part or portion of said wages or health and welfare funds, shall have violated this section and shall be punished or shall be subject to a civil citation or order as provided in M.G.L. Chapter 149. Section 27C. An employee claiming to be aggrieved by a violation of this section may, 90 days after the filing of a complaint with the attorney general, or sooner if the attorney general assents in writing, and within 3 years after the violation, institute and prosecute in his own name and on his own behalf, or for himself and for others similarly situated, a civil action for injunctive relief, for any damages incurred, and for any lost wages and other benefits. An employee so aggrieved who prevails in such an action shall be awarded treble damages, as liquidated damages, for any lost wages and other benefits and shall also be awarded the costs of the litigation and reasonable attorneys' fees.

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.

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.

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 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. 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 therefor.

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.

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.

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 days prior to the intended effective date thereof, which date shall be expressed in said notice.

Notice of cancellation sent by the party proposing cancellation by registered mail, postage prepaid, with a return receipt of the addressee requested, shall be a sufficient notice. An affidavit of any officer, agent or employee of the insurer or of the insured, as the case may be, duly authorized for the purpose, that he has so sent such notice addressed as aforesaid shall be prima facie evidence of the sending thereof as aforesaid. This section shall apply to the legal representative,

trustee in bankruptcy, receiver, assignee, trustee and the successor in interest of any such contractor. The superior court shall have jurisdiction in equity to enforce this section.

Whoever violates any provision of this section shall be punished by a fine of not more than one hundred dollars or by imprisonment for six months, or both; and, in addition, any contractor who violates any provision of this section shall be prohibited from contracting, directly or indirectly, with the commonwealth or any political subdivision thereof, for the construction, alteration, demolition, maintenance or repair of, or addition to, any public works or public building for a period of two years from the date of conviction of said violation.

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 Sections 38A 1/2 to 38O, inclusive, of Chapter 7, Section 39M of Chapter 30, Sections 44A-44J, inclusive, of Chapter 149, or Section 11C of Chapter 25A which is for an amount or estimated amount that exceeds the dollar amount set forth in M.G.L. Chapter 30, Section 39R.

3.1.2 "Contract" means any contract awarded or executed pursuant to Sections 38A 1/2 to 38O, inclusive, of Chapter 7, Section 39M of Chapter 30, Sections 44A-44J, inclusive, of Chapter 149, or Section 11C of Chapter 25A 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 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 accepting 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 has made and sets his 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 therefor 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 to Sections 38A 1/2 to 38O, inclusive, of Chapter 7, Section 39M of Chapter 30, Sections 44A-44J, inclusive, of Chapter 149, or Section 11C of Chapter 25A, shall provide that:

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

3.2.2 Until the expiration of six years after final payment, the awarding authority, office of inspector general, and the commissioner of capital asset management and maintenance shall have the right to examine any books, documents, papers or records of the Contractor or his Subcontractors that directly pertain to, and involve transactions relating to, the Contractor or his Subcontractors; and

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 description 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.

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

(i) to permit preparation of financial statements in conformity with generally accepted accounting principles, and

(ii) to maintain accountability for assets;

3.3.3 Access to assets is permitted only in accordance with management's general or specific authorization; and

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 commissioner of capital asset management and maintenance 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 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 five feet or more, except a trench for laying of water pipes dug to a depth of six and one-half feet which will be open less than 48 hours, and except for digging of graves.

4.4.1 Such trenches shall be shored and braced in conformity with rules and regulations for the prevention of accidents in construction operations, as adopted and enforced by the Attorney General.

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 4.6 shall apply to every contract entered into by the City of Worcester for the demolition, renovation, rehabilitation, or alteration of a building or structure.

- a. In furtherance of the requirements set forth in G.L. c.40, §54, and §114.1.3 of the State Building Code, the building commissioner 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.
- b. The verification required under sub-section (a), above, shall consist of the following:
 - 1) a dated receipt, signed by the owner/operator of the licensed solid waste disposal facility where the debris was deposited.
 - 2) the receipt shall contain a description of the debris disposed of, and its weight, or volume.
 - 3) the permit holder shall also provide the building commissioner with an affidavit that the receipt submitted is true and accurate to the best of the permit holder's knowledge.
 - 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 building commissioner shall be so notified, and the permit amended, prior to the disposal of the debris at the new disposal location.
- c. 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 4.7 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.

- a. The city council hereby finds and determines that taxpayer money is most efficiently and productively spent by awarding construction contracts to firms that 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. The city council hereby further finds and determines that it is appropriate for it to exercise its entrepreneurial discretion by requiring firms that are awarded such contracts to comply with this ordinance because failure to comply 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.
- b. Every contract awarded by the city under G.L. c.149 and G.L. 149A shall be deemed to incorporate by reference the provisions of sub-parts (c)(1) through (8) of together with the provisions of subsections (d) and (e) of this section. Any person, company or corporation shall acknowledge, in writing, receipt of said requirements with their bid or proposal.
- c. All bidders or proposers and all subcontractors and trade contractors, including subcontractors that are not subject to G.L. c.149, Section 44F, under the bidder for projects subject to G.L. c.149, Section 44A(2), and proposers under G.L. c. 149A, shall as a condition for bidding or subcontracting verify under oath and in writing at the time of bidding or subcontracting verify under oath and in writing at the time of bidding or subcontracting verify under oath and in writing at the time of budding or subcontracting verify under oath and in writing at the time of budding or subcontracting verify under oath and in writing at the time of budding or subcontracting verify under oath and in writing at the time of budding or subcontracting verify under oath and in writing at the time of budding or subcontracting verify under oath and in writing at the time of budding or subcontracting verify under oath and in writing at the time of budding or subcontracting verify under oath and in writing at the time of budding or subcontracting verify under oath and in writing at the time of budding or subcontract at any tier, that they comply with the following conditions for bidding or subcontracting and, for the duration of the project, shall comply with the following obligations:
 - 1) The bidder or proposer and all trade contractors and subcontractors under the bidder or proposer must comply with the obligations established under G.L. c. 149 to pay the appropriate lawful prevailing wage rates to their employees.

The bidder or proposer and all trade contractors and subcontractors under the bidder or proposer must at a the time of bidding maintain or participate in a bona fide apprentice training program as defined by G.L. c.23, Sections 11H and 11I for each apprenticable trade or occupation represented in their workforce that is approved by the Division of Apprentice Standards of the Department of Labor and Workforce Development, regardless of whether or not the program qualifies as an employee welfare benefit plan under ERISA, and must register all apprentices with the Division and abide by the apprentice to

journeyman ratio for each trade prescribed therein in the performance of any work on the project. This provision does not require the program to be an ERISA plan; the program need only have been approved by the Division of Apprentice Standards. All general bidders or proposers and all trade contractors and sub-bidders at every tier must submit with its bid or proposal an original, stamped Sponsor Verification letter from the Commonwealth of Massachusetts, Department of Labor and Workforce Development -Division Apprentice Standards, issued within the past 90 days, evidencing that at the time of submitting a bid or proposal, the bidder or proposer is currently an Approved Sponsor of Apprentices. Any bid or proposal submitted without the above documentation rejected; {COMPLIANCE shall be WITH THE TRAINING PROVISION APPRENTICE OF THE RESPONSIBLE **EMPLOYER ORDINANCE** IS **CURRENTLY SUSPENDED**

- The bidder or proposer and all trade contractors and subcontractors under the bidder or proposer must maintain appropriate industrial accident insurance coverage for all the employees on the project in accordance with G.L. c. 152;
- 3) The bidder or proposer and all trade contractors and subcontractors under the bidder must properly classify employees 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, Section 148B on employee classification);
- 4) The bidder or proposer and all trade contractors and subcontractors under the bidder or proposer must at the time of bidding certify that, at the time employees begin work at the worksite, all employees 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, and shall ensure that all employees working at the worksite possess such qualifications at all times throughout the duration of their work on the project and furnish documentation of successful completion of the course;
- 5) The bidder or proposer and all trade contractors and subcontractors under the bidder or proposer must be 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 under that statute by the Commonwealth Health Insurance Connector Authority.

- 6) The bidder or proposer and all trade contractors and subcontractors under the bidder or proposer must make arrangements to ensure that each employee of every contractor entering or leaving the project individually completes the appropriate entries in a daily sign-in/out log. The sign-in/out log shall include: the location of the project; current date; printed employee name; signed employee name; and the time of each entry or exiting. The log shall contain a prominent notice that employees are entitled under state law to receive the prevailing wage rate for their work on the project. Such sign-in/out logs shall be provided to the City on a daily basis.
- 7) The bidder or proposer and all trade contractors and subcontractors under the bidder or proposer, prior to bidding or, if not subject to bidding requirements, prior to performing any work on the project, shall sign under oath and provide to the City a certification that they are not debarred or otherwise prevented from bidding for or performing work on a public project in the Commonwealth of Massachusetts or in the City.
- d. A proposal or bid submitted by any general bidder or by any trade contractor or subcontractor under the general bidder or proposer that does not comply with any of the foregoing conditions for bidding shall be rejected, and no subcontract for work outside the scope of G.L. c.149, Section 44F shall be awarded to a subcontractor that does not comply with the foregoing conditions.
- e. All bidders or proposers and all trade contractors and subcontractors under the bidder or proposer who are awarded or who otherwise obtain contracts on the projects subject to G.L. c.149, Section 44A(2) or c.149A, shall comply with each of the obligations set forth in this Section 4.7 for the entire duration of their work on the project, and an officer of each bidder or subcontractor under the bidder shall certify under oath and in writing on a weekly basis that they are in compliance with such obligations.
- f. Any proposer, bidder, trade contractor or subcontractor under the bidder or proposer who fails to comply with any one of the obligations set forth in this Section 4.7 for any period of time shall be, at the sole discretion of the City, subject to one or more of the following sanctions:
 - 1) cessation of work on the project until compliance is obtained;
 - withholding of payment due under any contract or subcontract until compliance is obtained;
 - 3) permanent removal from any further work on the project;
 - 4) liquidated damages payable to the City in the amount of 5% of the dollar value of the contract.

g. In addition to the sanctions outlined in subsection (f) above, a proposer, general bidder or contractor shall be equally liable for the violations of its subcontractor with the exception of violations arising from work performed pursuant to subcontracts that are subject to G.L. c.149, Section 44F. Any contractor or subcontractor that has been determined by the City or by any court or agency to have violated any of the obligations set forth in this Section 4.7 shall be barred from performing any work on any future projects for six months for a first violation, three years for a second violation and permanently for a third violation.

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 delivering construction equipment and/or supplies at any construction site or project within the city of Worcester.

a. It shall be unlawful for any person, firm, corporation, partnership, or other entity to 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, 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 public works and parks or the commissioner of inspectional services.

It shall be unlawful for any person, firm, corporation, partnership, or other entity to engage in a construction project activity on Sundays or legal holidays without a permit from the police chief issued pursuant to G.L. c. 136, Section 7 or 15 and a permit issued by the commissioner of inspectional services hereunder.

- b. Emergency work permits may be issued in:
 - cases of urgent necessity and for the interests of health, safety and convenience of the public. The commissioner of inspectional services shall 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,

- 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 of inspectional services 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.
- c. 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.
- d. Prior to issuing or reissuing said emergency work permit, the commissioner of inspectional services 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.
- e. Emergency repair work performed by the Department of Public Works and/or any public utility is exempt from this section.
- f. The fee for each such Emergency work permits issued under this section shall be set in accordance with Chapter 2, § 24 of the City of Worcester Revised Ordinances of 2008.
- g. On any project for the construction, reconstruction, 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 therefor, the provisions of this section shall apply and the same shall be referred in every invitation to bid for such project and, the following paragraphs shall be contained in every resulting contract therefrom:

"It shall be a material breach of this contract if the contractor and each subcontractor 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. 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."

- h. The commissioner of inspectional services shall have the authority to adopt any rules and regulations he or she deems necessary to implement this section.
- i. 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 relative(s) of the owner, and said work is not being done for profit.
- j. This section may be enforced by the commissioner of inspectional services, the building commissioner, the chief of police or their subordinates.
- k. Any violation of this section 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 section occurs shall be considered a separate violation. Employers shall be deemed the violator for violations committed by their employees.

4.9 Regulation of Excessive and Unreasonable Noise: (Worcester Revised Ordinances, Chapter 9, Section 1A(e)(9) This paragraph 4.9 shall apply to anyone operating powered construction equipment delivering construction equipment and/or supplies at any construction site or project within the city of Worcester.

a. No person shall operate any powered construction equipment or build, erect, construct, demolish, alter, repair, excavate or engage in hoisting, grading, site work, including tree and brush removal, dredging or pneumatic hammering, or 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, except between the hours of 7:00 a.m. and 9:00 p.m. on weekdays and Saturday, and between the hours of 9:00 a.m. and 7:00 p.m. on Sundays, except for work performed by a public service or municipal utility department or "emergency work" performed with the express written permission of the commissioner of inspectional services or the commissioner of public works and parks. Emergency work shall be limited to such work that is clearly essential to respond to a sudden and unexpected threat to public health or public safety. Emergency work permission may be granted to a general or sub-contractor on a blanket basis governing all persons working on a specified portion of a particular job. Emergency work permission may be granted for not more than one week at a time, and may be renewed for additional one week periods at the discretion of the commissioner who granted the initial permission.

END OF SECTION 003000



CITY OF WORCESTER

FORM FOR GENERAL BID

BIDDER'S NAME

This bid must be accompanied by a deposit in the form of cash, or bid bond, or a certified check, treasurer's check, or cashier's check, payable to the City of Worcester (hereinafter referred to as the "Owner", or the "Awarding Authority") in the amount of five (5) percent of the value of the bid. No other form of bid security will be accepted.

By submitting this bid the undersigned represents to the Owner that it has examined and understands the Advertisement for Bids, Instructions to Bidders, contract forms, Conditions of the Contract (General and Supplementary), Drawings, Specifications and all other Contract Documents and has examined the site, as defined therein, and that this bid is made with distinct reference and relation to all said Contract Documents; but the undersigned declares that in regard to the conditions affecting the work to be done and the labor and materials needed, this bid is based solely on its own investigation and research and not in reliance upon any drawings, surveys, measurements, dimensions, calculations, estimates, or other tests or representations of any employee, officer, agent or consultant of the Owner. By submitting this bid, the undersigned agrees that it shall be subject to the jurisdiction of the courts of the Commonwealth of Massachusetts with respect to any actions arising out of or related to this bid or any contract that may be entered into based upon this bid, and that any such actions commenced by the undersigned shall be commenced in the courts of the Commonwealth of Massachusetts.

A bidder wishing to amend this bid after transmittal to the Owner may do so only by withdrawing this bid and resubmitting another bid prior to the time for opening bids.

To the Awarding Authority: The City of Worcester, Massachusetts

A. The undersigned proposes to furnish all labor and materials required for the Regional Emergency Communications Center, 2 Coppage Drive, Worcester, Massachusetts, in accordance with the accompanying Drawings, Specifications and Addenda, prepared by Clark C. Burritt, Principal Architect, Department of Public Works & Parks, Architectural Services, 50 Skyline Drive, Worcester, MA 01605, for the contract price specified below, subject to additions or deductions according to the terms of the Plans and Specifications.

| B. | This Bid includes | Addenda numbered | | |
|-----------|--|---|--------------------------------|-------------------------------------|
| C. | The Proposed Contract Price is (Total of Items 1 and 2): | | | |
| | | | Dollars (S | §) |
| D. | Alternates (refer t | to Section 012300, Alter | nates for a complete desc | ription of alternates): |
| | Alternate Numbe planned. \$ | r 1: State the amount t | to be ADDED for All S | Site Work as currently |
| | Alternate Numbe Building. \$ | r 2: State the amount to | o be ADDED for the C | overed Trailer Storage |
| E. | Unit Prices (refe prices): | r to Section 012200, U | Unit Prices for a comple | ete description of unit |
| | 1. Carry in the extensions (| Base Bid a quantity of Pile at exterior wall). | f (31) 50 KIP piles/pile | e caps/plates and |
| | \$p | er pile/pile cap and ext | ensions (add or deduct |). |
| | 2. Carry in the extensions (| Base Bid a quantity of Pile at interior column | f (21) 50 KIP piles/pile). | e caps/ plates and |
| | \$ po | er pile/pile cap and ext | ensions (add or deduct |) |
| F. | Item 1: The work of | the General Bidder, bein | ng all work other than tha | at covered by Item 2: |
| | | | Dollars (S | §) |
| G. | Item 2: The work requirement of se | of Filed Sub-bidders. I lected filed sub-bidders. | Fill in the name, sub-bio | d amount and bonding |
| | SUBTRADE SECTION | NAME OF SUB-BIDDER | SUB-BID AMOUNT | BONDS REQUIRED? "YES" OR "NO" |
| 055 ME | 00 TAL | | \$ | |

\$

FABRICATIONS

&CAULKING

WATERPROOFING, DAMPROOFING

07113

| SUBTRADE SECTION | NAME OF SUB-BIDDER | SUB-BID AMOUNT | BONDS REQUIRED? "YES" OR "NO" |
|---------------------------------------|-----------------------|-------------------|-------------------------------------|
| 088000 GLASS & GLAZING | | \$ | |
| 095113 ACOUSTICAL TILE CEILINGS | | | |
| 099123 INTERIOR PAINTING | | | |
| 210000 FIRE PROTECTION | | | |
| 220000 PLUMBING | | | |
| 230000 HVAC | | | |
| 260000 ELECTRICAL | | | |
| TOTAL I | TEM 2 | \$ | |

- H. The undersigned agrees that the above named sub-bidders will be used for the work indicated at the amount stated, unless a substitution is made. The undersigned further agrees to pay the premiums of the performance and payment bonds furnished by sub-bidders as requested herein and that all the cost of such premium is included in the amount set forth in ITEM 1 of this bid.
- I. The undersigned agrees that, if he is selected as a General Contractor, he will promptly confer with the Awarding Authority on the question of the sub-bidder(s); and that the Awarding Authority may substitute for any Sub-Bid listed above a Sub-Bid filed with the Awarding Authority by another sub-bidder for the sub-trade against whose standing and ability the undersigned makes no objection; and that the undersigned will use all such finally selected sub-bidder(s) at the amount named in their work as if they had been originally named in this general bid, the total contract price being adjusted to conform thereto.
- J. The undersigned agrees that, if he is selected as General Contractor, he will within five (5) days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the Awarding Authority, execute a contract in accordance with the terms of this bid and furnish a performance bond and also a labor and materials or payment bond, each of a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and satisfactory to the Awarding Authority and each in the sum of the

contract price, the premiums for which are to be paid by the General Contractor and are included in the contract price.

- K. The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work and that he will comply fully with all laws and regulations applicable to awards made subject to Section 44A of Chapter 149 of the Massachusetts General Laws.
- L. The undersigned further 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. The undersigned further certifies under penalties of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of Section Twenty-nine F of Chapter Twenty-nine, or any other applicable debarment provisions of any other Chapter of the Massachusetts General Laws or any rule or regulation promulgated there under.
- M. The undersigned hereby certifies that all employees to be employed at the worksite 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 at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that they will comply fully with all laws and regulations applicable to awards made subject to M.G.L. c.149 sec.44A-J.

| Date | Print Name of Bidder |
|--|--|
| Social Security Number or Federal Identification Number | By Name of Person Signing Bid and Title |
| Telephone Number | Business Street Address |
| Fax Number | City, State and ZIP Code |

The Bidder shall fill in the following information about its business organization.

1. If the Bidder is a Corporation, indicate the state of incorporation.

| President: | State of Incorporation: |
|------------|-------------------------|
| Treasurer: | Secretary: |

| If a Foreign Corporation: | Is the Corporation registered with the Secretary |
|---|--|
| (incorporated or organized under laws other | of State of Massachusetts? |
| than laws of the Commonwealth of | |
| Massachusetts) | Yes No |

If the Bidder is selected for the work referred to above, it is required under Massachusetts General Laws, Chapter 30, Section 39L to furnish to the Awarding Authority a certificate of the Secretary of State stating that the Corporation has complied with Massachusetts General Laws, Chapter 181, Sections 3 and 5 and the date of such compliance.

2. If the Bidder is a Partnership, give full names and addresses of all partners:

| Name of Partner: | Residence Address: |
|------------------|--------------------|
| Name of Partner: | Residence Address: |
| Name of Partner: | Residence Address: |
| Name of Partner: | Residence Address: |

3. If the Bidder is an Individual, give residential address if different from business address:

| Name: | Residence Address: |
|-------|--------------------|
|-------|--------------------|

4. If the Bidder is an Individual doing business under a Firm name:

| Name of Firm: | Business Address: |
|---------------------|--------------------|
| Name of Individual: | Residence Address: |

Other form of business organization:

N. The Bidder will give below the name and address of the Surety Company who will sign the bonds.

| Name: | Address: |
|-------|----------|
| | |

END OF SECTION 004000



CITY OF WORCESTER

FORM FOR SUB-BID

SUB-TRADE:

NAME OF SUB-BIDDER:

This bid must be accompanied by a bid deposit in the form of cash, or a bid bond, or a certified check, treasurer's check, or cashier's check, payable to the City of Worcester (hereinafter referred to as the "Owner" or the "Awarding Authority") in the amount of five (5) percent of the value of the bid. No other form of bid security will be accepted.

By submitting this bid the undersigned represents to the Owner that it has examined and understands the Advertisement for Bids, Instructions to Bidders, Contract Forms, Conditions of the Contract (General and Supplementary), Drawings, Specifications and all other Contract Documents and has examined the site, as defined therein, and that this bid is made with distinct reference and relation to all said Contract Documents, but the undersigned declares that in regard to the conditions affecting the work to be done and the labor and materials needed, this bid is based solely on its own investigation and research and not in reliance upon any drawings, surveys, measurements, dimensions, calculations, estimates, or other tests or representations of any employee, officer, agent or consultant of the Owner. By submitting this bid, the undersigned agrees that it shall be subject to the jurisdiction of the courts of the Commonwealth of Massachusetts with respect to any actions arising out of or relating to this bid or any contract that may be entered into based upon this bid, and that any such actions commenced by the undersigned shall be commenced in the courts of the Commonwealth of Massachusetts.

A bidder wishing to amend this bid after transmittal to the Owner may do so only by withdrawing this bid and resubmitting another bid prior to the time for opening bids. See: General Bid Form

To all General Bidders except those excluded:

A. The undersigned proposes to furnish all labor and materials required for completing the Work specified in Section(s) ________ of the Specifications for the Regional Emergency Communications Center, 2 Coppage Drive, Worcester, Massachusetts 01603, in accordance with the accompanying Drawings, Specifications and Addenda, prepared by Clark C. Burritt, Principal Architect, Department of Public Works & Parks, Architectural Services Division, 50 Skyline Drive, Worcester, MA 01605, for the contract price specified below, subject to additions or deductions according to the terms of the Plans and Specifications.
REGIONAL EMERGENCY COMMUNICATIONS CENTER

| | This Bid includes Addenda numbered |
|-----|---|
| | The Proposed Contract Price is: |
| | Dollars (\$ |
| | Alternates (refer to Section 012300, Alternates for a complete description of alternates): |
| pla | Alternate Number 1: State the amount to be ADDED for All Site Work as currently anned. |
| Bu | Alternate Number 2: State the amount to be ADDED for the Covered Trailer Storag nilding. |
| | Unit Prices |
| | Unit Prices (refer to Section 012200, Unit Prices for a complete description of Uni Prices): |
| | 1. Carry in the Base Bid a quantity of (31) 50 KIP piles/pile caps plates and extensions (Pile at exterior wall). |
| | <pre>\$ per pile/pile cap plate and extensions (add or deduct).</pre> |
| | 2. Carry in the Base Bid a quantity of (21) 50 KIP piles/pile caps plates and extensions (Pile at interior column). |
| | <pre>\$ per pile/pile cap plate and extensions (add or deduct)</pre> |
| | To restrict General Bidders, insert " X " on one option only and fill in blanks following that selection. If no General Bidders are excluded disregard this item. |
| | "RESTRICTED FROM" – This Sub-bid may be used by any General Bidder except: |
| | |
| | "RESTRICTED TO" – This Sub-bid may be used only by the following Genera Bidders: |
| | |
| | |
| | |

provisions of the section of the specifications for this sub-trade require a listing in this

paragraph, including the undersigned, if customarily furnished by persons on his own payroll and in the absence of a contrary provisions in the specifications, the name of each such class of work or part thereto and the bid price for such class of work or part thereof are:

| NAME | CLASS OF WORK | BID PRICE |
|------|---------------|-----------|
| | | |
| | | |
| | | |

(Do not give bid price for any class or part thereof furnished by undersigned.)

- F. The undersigned agrees that, if he is selected as a sub-bidder, he will, within five (5) days, Saturdays, Sundays and legal holidays excluded, after presentation of a subcontract by the general bidder selected as the general contractor, execute with such General Bidder a subcontract in accordance with the terms of this sub-bid, and contingent upon the execution of the general contract, and, if requested so to do in the general bid by such general bidder, who shall pay the premiums therefore, furnish a performance and payment bond of a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and satisfactory to the awarding authority, in the full sum of the subcontract price.
- G. The undersigned agrees that the above list of bids to the undersigned represents bona-fide bids based on the hereinbefore described drawings, specifications and addenda and that, if the undersigned is awarded the contract, they will be used for the work indicated at the amounts stated, if satisfactory to the Awarding Authority.
- H. The undersigned further agrees to be bound to the General Contractor by the terms of the hereinbefore-described drawings, specifications, including all general conditions stated therein, and addenda, and to assume toward him all the obligations and responsibilities that he, by those documents, assumes toward the Owner.
- I. The undersigned offers the following information as evidence of his qualifications to perform the work as bid upon according to all requirements of the drawings and specifications:
 - 1. The undersigned has been in the present business name _____ years.
 - 2. Has the undersigned ever failed to complete any work awarded?
 - 3. Provide a Bank Reference:
 - 4. List one or more recent project with names of the General Contractor and Architect on which you served as a Subcontractor for work of similar character as required for the above-named project.

| PROJECT NAME | GENERAL | ARCHITECT | AMOUNT OF |
|--------------|---------|-----------|-----------|
|--------------|---------|-----------|-----------|

| CONTRACTOR | CONTRACT |
|------------|----------|
| | |
| | |
| | |
| | |
| | |

- J. The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work and that he will comply fully with all laws and regulations applicable to awards made subject to Section 44A of Chapter 149 of the Massachusetts General Laws.
- K. The undersigned further 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. The undersigned further certifies under penalties of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of Section Twenty-nine F of Chapter Twenty-nine, or any other applicable debarment provisions of any other Chapter of the Massachusetts General Laws or any rule or regulation promulgated there under.
- L. The undersigned hereby certifies that all employees to be employed at the worksite 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 at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that they will comply fully with all laws and regulations applicable to awards made subject to M.G.L. c.149 sec.44A-J.

| Date | Print Name of Bidder |
|--|--|
| Social Security Number or Federal Identification Number | By Name of Person Signing Bid and Title |
| Telephone Number | Business Street Address |
| Fax Number | City, State and ZIP Code |

- M. The Bidder shall fill in the following information about its business organization.
 - 3. If the Bidder is a Corporation, indicate the state of incorporation.

REGIONAL EMERGENCY COMMUNICATIONS CENTER

| President: | State of Incorporation: |
|--|---|
| 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, Chapter 30, Section 39L to furnish to the Awarding Authority a certificate of the Secretary of State stating that the Corporation has complied with Massachusetts General Laws, Chapter 181, Sections 3 and 5 and the date of such compliance.

4. If the Bidder is a Partnership, give full names and addresses of all partners:

| Name of Partner: | Residence Address: |
|------------------|--------------------|
| Name of Partner: | Residence Address: |
| Name of Partner: | Residence Address: |
| Name of Partner: | Residence Address: |

5. If the Bidder is an Individual, give residential address if different from business address:

| Name: | Residence Address: |
|-------|--------------------|
| | |

6. If the Bidder is an Individual doing business under a Firm name:

| Name of Firm: | Business Address: |
|---------------------|--------------------|
| Name of Individual: | Residence Address: |

7. Other form of business organization:

REGIONAL EMERGENCY COMMUNICATIONS CENTER

N. The Bidder will give below the name and address of the Surety Company who will sign the bonds.

| Name: | Address: |
|-------|----------|
|-------|----------|

END OF SECTION 005000

c. 149 Projects

OWNER-CONTRACTOR AGREEMENT

THIS AGREEMENT made on ______ 20___, at Worcester, in the County of Worcester, Commonwealth of Massachusetts by and between______, (hereinafter called the Contractor) and the City of Worcester, a municipal corporation within said County of Worcester (hereinafter called the City).

WITNESSETH:

That the Contractor, in consideration of the payments hereinafter mentioned and of the fulfillment of the agreements herein mutually entered into, agrees with the City as follows:

SCOPE OF WORK:

(1) The Contractor shall, pursuant to the terms of this Agreement, provide all the supplies, materials and equipment, and perform all the labor, services and supervision necessary and proper to undertake and complete the ______, including Alternate(s)#_____ at _____, (hereinafter called the "Project") in the City of Worcester, Massachusetts, and to accomplish any and all work incidental thereto.

BONDS:

(2) The Contractor shall obtain and deposit with the City the following bond(s) in the amount of:

| PERFORMANCE BOND: | Dollars and no cents |
|-------------------|----------------------|
| | |

(\$_____.00)

PAYMENT BOND:

(\$_____.00)

with sureties satisfactory to the Contracting Officer to (a) guarantee the faithful performance by the Contractor of all its obligations under this Agreement and (b) constitute the security required by Massachusetts General Laws Chapter 149, Section 29, and Chapter 30, Section 39A, as amended, for the payment by the Contractor and its subcontractors for all labor performed or furnished and for all materials used or employed in connection with this Agreement.

Dollars and no cents

CONTRACTING OFFICER:

(3) (a) Wherever used in this Agreement the term "Contracting Officer" shall mean the City official so designated below, or the individual duly appointed by him/her for the performance of any of his/her functions or responsibilities under this Agreement. The work under this Agreement shall be carried out under the direction and subject to the approval and acceptance of Paul J. Moosey, P.E., City of Worcester, Department of Public Works & Parks (hereinafter called the Contracting Officer).

(b) Anything to the contrary in the preceding paragraph notwithstanding, the City's contract compliance officer is and shall be a designee of the Contracting Officer for all notices, demands, sanctions and other communications relative to such officer's administration, monitoring and enforcement of the City's Minority/Women Enterprise Program and the Responsible Employer Ordinance. Each and every communication from the contract compliance officer directly to the Contractor shall be validly delivered notwithstanding any other contrary provision of this Agreement or other Contract Documents.

INCORPORATED DOCUMENTS:

(4) The performance of this Agreement is subject to the provisions of the following documents, all of which are attached hereto and intended to be an integral part of this Agreement (hereinafter periodically and collectively referred to as "the Contract Documents").

____, 20 .

- (a) Information to Bidders
- (b) Bid Proposal, dated _____
- (c) Specifications and Related Drawings

The Contract Documents are to be read collectively and complementary to one another; any requirement under one shall be as binding as if required by all. In the event of any conflict or inconsistency between the provisions of this Agreement and any of the other Contract Documents, the provisions of this Agreement shall prevail. In the event of any conflict or inconsistency between this Agreement, the other Contract Documents and any applicable state law, the applicable statutory provisions shall prevail. The Contract Documents set forth the entire legal relationship and requirements of the parties, as well as the technical requirements of the Project, and as such constitute the Contract, as hereinafter referred to.

TIME FOR PERFORMANCE:

(5) (a) Time is of the essence for this Agreement. The Work of this Agreement shall be substantially completed no later than September 30, 2014. Final completion of the Work of this Agreement shall be no later than 60 days after the date of substantial completion. The

Date of Substantial Completion shall remain the same, as stated above, regardless of any alternate(s) chosen to be included in the Contract by the Owner.

(b) If the Contractor shall neglect, fail or refuse to achieve Substantial Completion of the Work within the Contract Time, as adjusted in accordance with the provisions of the Contract Documents, the Contractor and the Contractor's Surety agree, as a part of the consideration for the execution of this Agreement by the City to pay the City the amounts set forth below, not as a penalty, but as liquidated damages to cover certain losses, expenses and damages of the City for such breach of contract as herein set forth. The Contractor acknowledges that delay in Substantial Completion of the Project will cause disruption of the Worcester Public School Department's operations. Such disruptions include without limitation, loss of productivity and efficiency and duplication of effort. Delay in Substantial Completion will also require the City to incur additional costs for compensation to the Designer and other consultants or contractors for extended or additional work on the Project. In light of the costs, damages, losses, risks and liabilities described above, the parties have agreed upon the liquidated damages stated below. Such damages have been fixed and agreed upon because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the City would in such event sustain, and said amounts may be retained by the City on or after the scheduled date of Substantial Completion from current progress payments, any other amounts owing to the Contractor or, to the extent not so retained, shall be paid promptly by the Contractor or its Surety to the City. The agreed liquidated damages amount is \$500.00 per day per site of delay in achieving Substantial Completion. Conversely, should the Contractor reach substantial completion on or before August 29, 2013, one year prior to the date specified in Article 5(a), a lump sum incentive in the amount of \$35,000.00 (thirty five thousand dollars) will be paid by the City to the Contractor.

(c) Except as otherwise expressly provided, none of the following shall constitute a waiver of the General Bidders or its surety's obligations to pay liquidated damages or any portion thereof:

- (i) Acceptance of any portion of the Work or payment to the Contractor or its Surety therefor;
- (ii) Completion of a portion of the Work or the use or occupancy thereof by the City or others; or
- (iii) The City's requiring or allowing the Contractor or its Surety to complete the Work.

PRICE:

(6) The City will pay the Contractor for all materials delivered or furnished and for all the work performed pursuant to Article (1) hereof a sum of money as follows:

Dollars and no cents (\$_____.00)

PAYMENT:

(7) Payment to the Contractor shall be made by the City in accordance with General Laws Chapter 30, Section 39K, as amended, which is included in the Supplementary General Conditions to the Contract.

(a) The payment shall be in full for furnishing all materials, supplies, labor, services, supervision, tools and equipment and the use thereof as embraced under the Agreement, and except as may be provided under Article (10)(d), shall also constitute the payment for all loss or damage to the Contractor arising out of the nature of the work or from the action of the elements or from any unforeseen difficulties or obstructions which may arise or be encountered during the execution of the work until its final approval by the Contracting Officer, and for all risks to the Contractor of every description connected with the execution of the work or infringement of patents, trade marks, or copyrights and for completing the work in an acceptable manner.

(b) The payment of any periodic estimate or of any retained percentage shall in no way constitute an acceptance of the work or in no way prejudice or affect the obligation of the Contractor at his own cost or expense to repair, correct, renew, or replace any defects or imperfections in the construction as well as all damages due or attributable to such defects, nor shall any such payment for any current estimate or of any retained percentages prejudice or affect the rights of the City to hold the Contractor liable for breach of contract or to avail itself of the remedies under Article (15), hereof.

(c) If at any time there shall be evidence of any lien or other claim for which, if established, the City may become liable, directly or indirectly, and which is chargeable to the Contractor, the City may retain out of any payment then due or thereafter to become due, an amount sufficient to completely indemnify it against any such claim. If there prove to be any such claims after all the payments are made, the Contractor shall refund to the City all moneys that the City pays in discharging such claim in consequence of the Contractor's default.

(d) The Contractor, and each subcontractor, at every tier, to the Contractor, represents, warrants and certifies that it has complied with all laws of the Commonwealth of Massachusetts relating to taxes and all Ordinances and Orders of the City of Worcester relating to taxes, fees and charges, or is lawfully contesting the validity of the same. The Contractor, and each subcontractor, at every tier, further represents, warrants and certifies that it will remain in such compliance during the term of this Agreement, including any amendments or extensions hereto. Breach of any of these provisions shall be deemed a material breach which shall entitle the City to immediately terminate this Agreement and take any other action authorized by law to collect any amounts due the City.

PAYMENT OF SUBCONTRACTORS:

(8) Payment to subcontractors shall be made in accordance with General Laws Chapter30, Section 39F, as amended, which is included in the Supplementary General Conditions.

NOTICE:

(9) Wherever in this Agreement the City is to give or receive a notice, the Contracting Officer as defined in Article (3) shall be the City's Agent for such purpose.

PERFORMANCE:

(10) (a) The Contractor shall give his personal attention constantly to the faithful execution of the work and shall keep the same under his personal control. He shall not assign by power of attorney, or otherwise, the work or any part thereof without the previous written consent of the Contracting Officer. He shall not either legally or equitably assign any of the moneys payable under this Agreement or any claim thereto unless by and with like consent on the part of the Contracting Officer and the City Treasurer. He shall be responsible for all the acts and omissions of his employees and of all persons directly or indirectly employed by him in connection with the execution of this work.

(b) The Contractor shall provide sufficient and proper facilities at all times for the inspection of the work by the City. He shall, after receiving written notice that certain work or construction is improper, unsafe or defective or that such construction in any way fails to conform to the Contract Documents, forthwith remove such unsafe or defective construction and reconstruct the same in a manner satisfactory to the Contracting Officer. Upon failure of the Contractor to remedy the construction after being so notified, the Contracting Officer in accordance with Article 3.4.1 of the General Conditions may cause such defective work to be remedied or replaced and the City may deduct the cost thereof from any moneys due or to become due the Contractor.

(c) The City, acting through the Contracting Officer, or the project Architect, shall have the authority to suspend the work wholly or any part thereof for such period as deemed necessary due to failure of the Contractor to carry out orders given or to perform any provision of the Agreement. Upon receipt of written order from the Contracting Officer or Architect, the Contractor shall immediately suspend the work or such part thereof in accordance with the order. No work shall be suspended without the written permission of the Contracting Officer or Architect. The work shall be resumed when conditions so warrant or deficiencies have been corrected and the condition of the Contract satisfied as ordered or approved in writing by the Contracting Officer or Architect. No allowance of any kind will be made for suspension of work by order of the Contracting Officer or Architect pursuant to this paragraph.

(d) Any request for an adjustment in the contract price by the Contractor or the City, due to differing subsurface or latent physical conditions, shall be governed by the provisions of General Laws Chapter 30, section 39N, as amended, which is included in the Supplementary General Conditions.

(e) The Contractor agrees that it shall have no claim for damages of any kind on account of any delay in commencement of the work. Post commencement, the Contractor shall have no claim for damages of any kind on account of any delay or suspension of any portion of the work except as hereinafter provided. Adjustments, if any, in the contract price due to a suspension, delay, interruption or failure to act by the City shall be governed by the provisions of General Laws Chapter 30, section 39(O), as amended, which is included in the Supplementary General Conditions. Provided, however, the provisions of this paragraph shall not apply to any suspension pursuant to Section (10)(c), or for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this Agreement provides for an equitable adjustment of the contract price, or time, under any other provision. Provided, further, that no adjustment shall be made if the performance of the Contractor would have been prevented by other causes, even if the work had not been so suspended, delayed or interrupted by the City. Provided, further, that a subcontractor shall have the same rights against the Contractor for payment for an increase in the cost of his performance as the provisions of this paragraph gives the Contractor against the City, but nothing herein shall in any way change, modify or alter any other rights which the Contractor and subcontractor may have against each other.

(f) The City may award other contracts for additional work. The Contractor shall cooperate fully with other contractors and carefully fit his own work to that of other contracts as may be directed by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor.

(g) The Contractor shall comply with all the laws, state and federal, applicable to the work and construction provided for herein. This Agreement is made subject to all laws, state and federal; and if any clause hereof does not conform to such law, then such clause shall be void and the law operative shall be inserted in lieu thereof. Any violation by the Contractor of state or federal laws relating to the employment of labor upon the work or the construction contemplated by this Agreement shall be a sufficient cause for the City to cancel the Agreement without in any way being liable in damages therefor. Should the City cancel the Agreement because of the failure on the part of the Contractor to observe the state or federal laws, or the rules and regulations relating to employment of labor upon the work herein contemplated, then upon cancellation the City reserves all rights and benefits herein or by law provided against the Contractor for the breach of the conditions of this Agreement.

(h) It shall be a material breach of this Agreement if the Contractor and each subcontractor shall not at all times adhere to the provision of 1A(e)(9) of chapter nine of the Revised Ordinances of the city by limiting their on-site, noise producing construction and related work to the hours specified by said ordinance.

(i) When the use of explosives is necessary for the execution of the work, the Contractor shall take the utmost care not to endanger life and property. Whenever directed, the number and size of the charges shall be reduced. All explosives shall be stored in a secure manner. All such storage places shall be marked clearly "DANGEROUS-EXPLOSIVES", and shall be in the care of competent watchmen at all

times. The method of storage and handling explosives and highly inflammable materials shall conform to all the state laws and regulations, as well as any local requirements.

(j) Upon the completion of the work the Contractor shall, at his own expense, remove all equipment, temporary Contractor's buildings and sheds, fencing, rubbish and waste material in and about the area that has been worked and he shall leave the premises and the work performed all in a neat and proper condition.

(k) Before commencing the work the Contractor shall, if required, submit a schedule of operations for approval of the Contracting Officer or Architect. The schedule shall show the methods and order of operations that the Contractor proposes to use. The approval of the schedule by the Contracting Officer or Architect shall not be construed as relieving the Contractor from any responsibility.

(1) Should the Contractor be obstructed or delayed in the execution of the work as a result of damage which may be caused by lightning, earthquake, rain, storm, or cyclone, then the time fixed for completion may be extended for a period equivalent to the time lost by reason of any of the foregoing causes. No such extension shall be made unless a claim therefor is presented in writing to the Contracting Officer within forty-eight (48) hours of the occurrence of such delay. The Contractor shall have no claim against the City for damages on account of such delay. The duration of the extension itself must be certified to by the Contracting Officer or Architect.

ADDITIONAL WORK:

(11) (a) The Contractor agrees to perform any work related to the subject matter of the Contract, but not within its original scope, upon written order of the Contracting Officer or Architect, the payment for such extra work to be made in accordance with whichever of the following methods the Contracting Officer elects: (i) a price agreed upon between the parties and stipulated in the order for the extra work; or (ii) a price based on the unit prices of the contract; or (iii) a price determined to be the reasonable cost of the extra work as computed by the Contracting Officer in accordance with paragraph (b) below.

(b) In computing reasonable cost for the purposes of (iii) above, the Contracting Officer shall include the reasonable cost to the Contractor,

(i) of the cost of prevailing rates for direct labor, material, and use of equipment;

(ii) plus the cost of worker's compensation insurance, liability insurance, federal Social Security insurance, and Massachusetts unemployment compensation insurance or, as an alternative, the Contractor may elect to use a flat twenty-five percent (25%) of the total labor rate in (a);

(iii) plus ten percent (10%) of the total labor rate in (a) for overhead, superintendence and profit, which will be paid to the Contractor for Item 1 work, which is

the work of the Contractor and all its non-filed subcontractors. On Item 2 work, which is the work of filed subcontractors, this ten percent (10%) will be allowed only to the filed subcontractor and is not applicable to any Paragraph E sub-subcontractors. The Contractor or the filed subcontractor, as the case may be, shall agree upon the distribution of the ten percent (10%) to their respective subcontractors as a matter of contract therewith;

(iv) for work performed by a filed subcontractor, the Contractor shall accept an additional five percent (5%) of the filed subcontractor's price (less the 10% mark-up), as full compensation for processing forms and assuming full responsibility for the faithful performance of such work by the filed subcontractor(s);

(v) plus actual direct premium costs of payment and performance bonds required of the Contractor and filed subcontractors, provided there will be an appropriate credit for premiums for a credit change order; and

(vi) if the extra work requires the use of heavy equipment, cranes and hoisting equipment, machinery, and special tools not on site and not originally required to be used upon the work, then the cost of transportation to and from the work site, not exceeding 100 miles, shall be included. The cost of extra work shall not include any cost or rental of small tools, buildings, or any portion of the time of Contractor's management or office personnel, or any allowance for use of capital.

(c) The Contracting Officer or Architect may make alterations in the line, grade, plan, form, dimensions, or materials of the subject matter of the Contract, or any part thereof, either before or after commencement of construction. Where such alterations increase the quantity or standard of the work to be done, payment for such increase shall be made in the same way that payment is made for extra work under (a) and (b) above. Where such alterations diminish the quantity or standard of the work to be done, an adjustment shall be made to the benefit of the City based upon the unit prices where used or, where unit prices are not used, as the Contracting Officer shall determine.

EMPLOYMENT:

(12) (a) The Contractor shall employ competent workers and if notified by the Contracting Officer, in writing, that any person engaged upon the work is incompetent, unfaithful, disorderly or otherwise unsatisfactory, then such worker shall be discharged from the work.

(b) In the performance of this Agreement, the Contractor shall comply with the provisions of Worcester Revised Ordinances Chapter 2, Section 35 as amended, which are included in the Supplemental General Conditions to the Contract.

(c) The parties shall comply with the provisions of section 179A of Chapter 149 of the Gen. Laws (Ter. Ed.). Notwithstanding any provisions to the contrary contained in the General or Supplemental Conditions to the Contract, in the employment of persons including mechanics, teamsters, chauffeurs and laborers, under this Contract, preference shall be given:

- First: To citizens of the Commonwealth who are residents of the City of Worcester and who have served in the Armed Forces of the United States in time of war and have been honorably discharged therefrom or released from active duty therein, and who are qualified to perform the work to which the employment relates.
- Second: To citizens of the Commonwealth who are residents of the City of Worcester and are qualified to perform the work to which the employment relates.
- Third: 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 therefrom or released from active duty therein and who are qualified to perform the work to which the employment relates.
- Fourth: To citizens of the Commonwealth generally.
- Fifth: To citizens of the United States.

The foregoing provisions shall not apply to those persons employed in a supervisory capacity. In so far as practicable preference is to be given Worcester Truckers in hauling materials.

(d) No laborer, worker, mechanic, foreman, or inspector working within the Commonwealth of Massachusetts in the employ of the Contractor, sub-contractors, or other persons doing or contracting to do the whole or part of the work contemplated by this Agreement, shall be required or permitted to work more than eight (8) hours in any one (1) calendar day; or more than forty-eight (48) hours in one (1) week, or more than six (6) days in any one (1) week in full compliance with provisions of G.L. c. 149, s. 34, except in cases of emergency.

(e) Every employee in the work covered by the Contract shall lodge, board and trade where and with whom he elects and neither the Contractor nor his agents or employees shall directly or indirectly require as a condition of employment therein that an employee shall lodge, board or trade at a particular place or with a particular person.

(f) The Contractor shall provide and maintain in a neat and sanitary condition such accommodations for the use of his employees as may be necessary to comply with the requirements of the Department of Public Health, local health officials or of other appropriate authorities. The maintenance of all sanitary facilities shall be subject to the laws of the Commonwealth and to the rules and regulations of the State Board of Health and of the Commissioner of Public Health for the City of Worcester.

(g) The Contractor shall, before commencing the work, provide by insurance for the payment of compensation and the furnishing of other benefits under Chapter 152 of the General Laws to all persons employed under the Agreement, and he shall continue such insurance in force and effect during the term hereof. The City may require the Contractor to deliver certificates of insurance as sufficient proof of compliance with the foregoing. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the Agreement and shall entitle the City to terminate the Agreement without in any way being liable in damages therefor.

(h) The Contractor shall keep a true and accurate register of all mechanics, teamsters, chauffeurs and laborers employed upon the work contemplated by this Contract, showing the name, address and occupational classification of each such employee, the hours worked by and the wages paid to each such employee, and shall furnish the Massachusetts Department of Labor and Industries, upon its request, a true statement thereof.

(i) Minimum wage rates under the provisions of General Laws chapter 149, section 27, as amended, have been determined by the Commissioner of Labor and Industries for the Commonwealth, and the Contractor shall in the payment of wages be bound by them during the life of the Agreement. The applicable schedule of minimum wage rates, as so determined, are incorporated elsewhere within the Contract Documents.

TERMINATION:

(13) (a) If the Contractor shall be adjudged as bankrupt, or if he shall make a general assignment for the benefit of his creditors, or if a receiver of his property shall be appointed, or if the work to be done under the Agreement shall be abandoned, or if the Agreement or any part of shall be sublet without the previous written consent of the Contracting Officer, or if the Contract or any claim hereunder shall be assigned by the Contractor otherwise than as herein specified, or if at any time the Contracting Officer shall be of the opinion that the work, or any part thereof, is unnecessarily or unreasonably delayed, or that the Contractor has violated any of the provisions of the Agreement, the Contracting Officer, for and in behalf of the City, may notify the Contractor to discontinue all work, or any part thereof; and thereupon the Contractor shall discontinue such work or such part thereof as the Contracting Officer directs, and the City may thereupon, by contract or otherwise, as it may determine, complete the work, or such part thereof, and charge the entire expense of so completing the work or any part thereof to the Contractor.

(b) If the Contracting Officer or Architect shall certify by written notice to the Contractor that the rate of progress is not satisfactory, the City may, instead of notifying the Contractor to discontinue all of the work or any part thereof, notify him from time to time to increase the force, equipment and plant, or any of them, employed on the whole or any part of the work, stating the amount of increase required. Unless the Contractor shall, within seven (7) work days after such notice, increase his force, equipment and plant to the extent required therein, and maintain and employ the same from day to day until the

completion of the work or such part thereof or until the conditions as to the rate of progress shall, in the opinion of the Contracting Officer or Architect, be fulfilled, the City may employ and direct the labors of such additional force, equipment and plant as may, in the opinion of the Contracting Officer or Architect, be necessary to ensure the completion of the work or such part thereof within the time specified or at the earliest possible date thereafter, and charge the expense thereof to the Contractor. Neither the notice from the Contracting Officer or Architect to the Contractor to increase his force, equipment or plant nor the employment of additional force, equipment or plant by the City shall be held to prevent a subsequent notice to the Contractor from the City to discontinue the work under the provisions of the preceding portion of this Article.

(c) All expenses charged under this Article shall be deducted by the City out of moneys then due or to become due the Contractor under this Agreement, or any part hereof. In such accounting the City shall not be obligated to obtain the lowest figures for the work of completing the contract or any part thereof, or for insuring its proper completion, and all sums actually paid by the City shall be charged to the Contractor. If the expense so charged is greater than the sum which would have been payable under the Agreement, if the same had been completed by the Contractor, then the Contractor shall pay the amount of the excess to the City upon completion of the work and without further demand being made therefor.

(d) The Contractor shall not be relieved of liability to the City by virtue of any termination of this Agreement and any claim for damages against the Contractor relating to the Contractor's performance hereunder shall survive any termination hereunder.

GUARANTEES:

(14) (a) The Contractor guarantees the work under this Contract and the materials furnished by him for use in connection therewith to be free from defects or flaws for one (1) year after the completion of the work, unless a greater period of time is prescribe by law, or by terms of any special guarantee required under any other provisions of the Contract Documents. It is expressly understood, however, that this guarantee provision shall not absolve the Contractor from any liability to the City arising out of a failure to substantially comply with the terms of the Agreement.

(b) If at any time within said guaranty period, any part of the work constructed under the terms of this Agreement shall, in the opinion of the Contracting Officer or Architect, require repairing due to defective work or materials furnished by the Contractor, he may notify the Contractor in writing to make the required repairs. If the Contractor shall neglect to start such repairs within ten (10) work days of the date of giving him notice thereof and to complete the same to the satisfaction of the Contracting Officer or Architect with reasonable dispatch, then the latter may employ other persons to make such repairs. The City shall charge the expense thereof to the Contractor and may use any moneys still retained to pay for the same, and if such sum is insufficient, the Contractor shall be obligated to pay the balance thereof.

INDEMNIFICATION:

(15) (a) The Contractor shall indemnify and save harmless the City of Worcester and all of its officers, agents and employees against all suits, claims or liability of every name, nature, and description arising out of or in consequence of the acts or omissions of the Contractor in the performance of the work covered by the Agreement and/or his failure to comply with the terms and conditions hereof, and will at his own cost and expense defend any and all such suits and actions.

(b) The Contractor shall bear all losses resulting from the use or storage of explosives and highly inflammable materials, and shall save the City harmless from all claims for bodily injuries or death to any person and from all claims for property damage or destruction arising out of the use or storage of explosives and highly inflammable materials.

(c) The Contractor further covenants to hold and save the City, its officers, servants and employees harmless from and against all and every demand or demands, of any nature or kind for or on account of the use of any patented invention, article or appliance included in the materials and equipment agreed to be furnished, supplied or used under this Agreement.

INSURANCE:

(16) (a) The Contractor shall carry public liability insurance with an insurance company satisfactory to the City so as to save the City harmless from any and all claims for damages arising out of bodily injury to, or death of, any person or persons and for all claims for damages arising out of injury to, or destruction of, property caused by accidents resulting from the use of implements, equipment or labor used in the performance of the Agreement or from any neglect, default omission or want of proper care or misconduct on the part of the Contractor or of any one in his employ during the execution of the work. Such insurance shall include coverage for blasting and explosion, if explosives are to be used.

(b) The Contractor shall carry any other types of insurance as may be required elsewhere in the Contract Documents. All insurance policies required in the Contract Documents shall be provided by companies satisfactory to the City.

(c) Prior to starting work under this Agreement, the Contractor shall deposit, with the City's Law Department, certificates from the insurers to the effect that the insurance policies required in the above paragraphs have been issued to the Contractor. The certificates must be on a form satisfactory to the Law Department.

(d) Unless greater amounts of insurance coverage are required elsewhere in the Contract Documents, the amounts of such public liability insurance shall not be less than the minimum amounts set forth below:

- Liability for bodily injury, including accidental death, \$250,000.00 for any one person and, subject to the same limit for each person, \$500,000.00 on account of one accident.
- (ii) Liability for property damage, \$100,000.00 on account of any one accident and \$300,000.00 on account of all accidents.
- (iii) Workers' compensation/employers' liability MA statutory requirements.

(e) Unless greater amounts of insurance coverage are required elsewhere in the Contract Documents, the Contractor shall also carry bodily injury and property damage insurance in amounts not less than those set forth above, covering the operation of all motor vehicles owned by the Contractor and engaged in this work.

(f) No cancellation of any insurance whether by the insurer or by the insured shall be effective unless written notice thereof is given to the City at least fifteen (15) days prior to the intended effective date thereof, which date has been expressed in the notice. Prior to the effective date of any such cancellation the Contractor shall take out new insurance to cover the policies so cancelled. The Insurance Companies shall remain liable, however, until new and satisfactory insurance policies have been delivered to, and accepted by, the City.

CONFLICT OF INTEREST:

(17) (a) The Contractor warrants that he has complied with all provisions of law regarding the award of this Contract and that he, or his employees, agents, officers, directors or trustees have not offered or attempted to offer anything of any value to any employee of the City in connection herewith.

(b) The Contractor further warrants that no elected official or employee of the City of Worcester, including unpaid members of City boards and commissions, serves as an officer, director, trustee or employee of Contractor, and that no elected officials or employees of the City of Worcester have or will have a direct or indirect financial interest in this Agreement. The foregoing shall not apply, however, if the Contractor qualifies for an exemption and complies with the applicable disclosure provision(s) under G. L. c. 268A.

(c) Violation of this Article shall be a material breach of this Agreement and shall be grounds for immediate termination hereof by the City without regard to any enforcement activities undertaken or completed by any enforcement agency. Termination of this Agreement pursuant to this Article shall not waive any claims for damages the City may have against the Contractor resulting from the Contractor's violation of the terms of this Article.

SEVERABILITY:

(18) If any provision of this Agreement is held invalid by any court or body of competent jurisdiction, the remainder of this Contract shall remain in full force and effect.

HEADINGS:

(19) The section headings in this Agreement are for convenience and reference only and in no way define or limit the scope or content of this Agreement or in any way affect its provisions.

AMENDMENTS:

(20) This Agreement may be amended or modified only by written instrument duly executed by the parties.

ENTIRE AGREEMENT:

(21) This Agreement contains the entire understanding of the parties and supercedes all prior agreements, representations, proposals and undertakings of the parties.

IN WITNESS WHEREOF the Contractor has hereunto set his hand and seal and the City has caused its corporate seal to be hereto affixed and this Agreement to be executed in its name and behalf by a duly authorized officer thereof the day and year first above written.

CITY OF WORCESTER

RECOMMENDED:

CONTRACTOR

BY: _____(SEAL)

Paul J. Moosey P.E. Commissioner Department of Public Work & Parks

APPROVED AS TO LEGAL FORM:

CERTIFICATION OF FUNDING

I certify that an appropriation of funds in the amount of this Agreement is contained in account number _____.

Robert V. Stearns City Auditor

APPROVED:

Edward M Augustus Jr. City Manager

PAYMENT BOND

KNOW ALL BY THESE PRESENTS, that _____, a _____ corporation duly established by law and having a usual place of business at _____, a corporation organized as PRINCIPAL, and____ under the laws of the State or Commonwealth of , and duly authorized and admitted, under the provisions of Chapter 175 of the Massachusetts General Laws, as amended, to transact the business of a fidelity and surety company in Massachusetts, as SURETY, are held and firmly bound unto the City of Worcester, a municipal corporation within Commonwealth Massachusetts, the of in the sum of Dollars and no cents (\$.00) lawful money of the United States of America, to be paid to the City of Worcester, its successors and assigns, to the payment of which, well and truly to be made, the PRINCIPAL and the SURETY bind themselves, their respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

| W | HEREA | S, the | said | <u>PRIN</u> | CIPAL has | entered | into a | n Ag | reeme | nt of | even | date |
|----------|--------|--------|------|-------------|-----------|---------|--------|-------|-------|-------|-------|--------|
| herewith | with | the | City | of | Worcester | , said | Agre | eemer | nt be | eing | for | the |
| | | | _ at | | | | in | the | City | of | Worce | ester, |
| Massachu | setts; | | | | | | | | | | | |

NOW THEREFORE, the condition of this obligation is such that if the <u>PRINCIPAL</u> shall pay for all labor performed or furnished and for all materials used or employed or any appliance and equipment used or employed or rented or hired out in the execution of said Agreement and in any and all duly authorized modifications, alterations, extensions of time, changes or additions to said Agreement that may hereafter be made, notice to the <u>SURETY</u> of such modifications, alterations, extensions of time, changes or additions being hereby waived, the foregoing to include any other purposes or items set out in, and to be subject to, the provisions of Massachusetts General Laws, Chapter 149, Section 29 and Chapter 30, Section 39A, as amended, then this obligation shall become null and void; otherwise it shall remain in full force and virtue.

IN TESTIMONY WHEREOF, the <u>PRINCIPAL</u> has hereunto caused its name and seal to be affixed, and the <u>SURETY</u> has caused its corporate seal to be hereunto affixed by a duly authorized officer thereof and this instrument to be executed and delivered in its name and behalf by its attorney-in-fact, duly authorized by its by-laws and votes, powers of attorney, and letters of appointment and authorization, certificated copies of which documents are annexed to this bond and may be introduced in evidence as if a part hereof.

| (| PRINCIPAL | (SEAL) |) |
|----|-----------------------|--------|---|
| ١. | $1 \times 10^{\circ}$ | | 1 |

By:_____

(SURETY) (SEAL)

Attorney-in-Fact

PERFORMANCE BOND

KNOW ALL BY THESE PRESENTS, that _______, a_______ corporation duly established by law and having a usual place of business at_________ as <u>PRINCIPAL</u>, and________, a corporation organized under the laws of the State or Commonwealth of_______, and duly authorized and admitted, under the provisions of Chapter 175 of the Massachusetts General Laws, as amended, to transact the business of a fidelity and surety company in Massachusetts, as <u>SURETY</u>, are held and firmly bound unto the City of Worcester, a municipal corporation within said Commonwealth of Massachusetts, in the sum of \$______Dollars and no cents (\$_______.00) lawful money of the United States of America, to be paid to said City of Worcester, its successors and assigns, to the payment of which, well and truly to be made, the <u>PRINCIPAL</u> and the <u>SURETY</u> bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said <u>PRINCIPAL</u> has entered into an Agreement of even date herewith with the City of Worcester, said Agreement being for the ______, inclusive, at ______ in the City of Worcester, Massachusetts;

NOW THEREFORE, the condition of this obligation is such that if the said <u>PRINCIPAL</u> shall well and faithfully perform all the terms and conditions of said Agreement on its part to be kept and performed as therein stipulated, including guarantee and maintenance provisions therein, and shall pay for all materials furnished and for all labor performed in the execution of said Agreement, and shall indemnify and save harmless the said City of Worcester as therein stipulated, then this obligation shall be of no effect; otherwise it shall remain in full force and virtue.

And the said <u>SURETY</u>, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of said Agreement, or to the work to be performed thereunder, or to the specifications accompanying the same, shall in any way effect its obligation on this bond; and it does hereby waive notice of any change, extension of time, alterations or additions to the terms of said Agreement, or to the work, or to the specifications.

In the event that the Agreement is abandoned by the Contractor, or is terminated by the City of Worcester, under the provisions thereof, said <u>SURETY</u> hereby further agrees that it shall, if requested in writing by the City of Worcester, take such action as is necessary to complete said Agreement.

IN TESTIMONY WHEREOF, the <u>PRINCIPAL</u> has hereunto caused its name and seal to be affixed, and the <u>SURETY</u> has caused its corporate seal to be hereunto affixed by a duly authorized officer thereof and this instrument to be executed and delivered in its name and behalf by its attorney-in-fact, duly authorized by its by-laws and votes, powers of attorney, and letters of appointment and authorization, certificated copies of which documents are annexed to this bond and may be introduced in evidence as if a part hereof.

| (PRINCIPAL) | | (SFAI) | |
|-------------|---|--------|--|
| (FKINCIFAL) | / | (SĽAL) | |

By: _____

(SURETY)_____(SEAL)

Attorney-in-Fact

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:

DATE: _____

Pursuant to Mass. G.L. c. 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 & No | | |
| | | Signature of Individual |
| | | or |
| | | Corporate Officer (if applicable) |
| City or Town | Tel No | |
| STATE | Zip Code | |
| | | |
| SOCIAL SECURITY N | UMBER | |
| OR | | |

FEDERAL IDENTIFICATION NUMBER

CERTIFICATE OF VOTE OF AUTHORIZATION

Date _____

| Ι | hereby | certify | that | at a | meeting | g of | the | Board | of | Directors | of: |
|-----|-------------|-------------|----------|-----------|-----------|----------|----------|-----------|----------|-------------|--------|
| | | | | | _ duly c | alled | and h | eld on | the _ | da | ıy of |
| | | , 20 | , at | which | time it w | vas vot | ed that | .t | | (n | ame), |
| | | (ti | tle) be | and he | reby is a | uthorize | ed to e | execute a | and de | liver for a | nd in |
| be | half of | the co | orporati | on, a | contrac | t with | n the | City | of | Worcester | for |
| | | | (tl | he "Pro | ject") in | the Cit | ty of V | Vorceste | er and, | as Princip | oal to |
| ex | ecute a Pe | erformanc | e Bond | and Lab | oor and M | aterials | Bond | in conne | ection t | herewith, v | which |
| Co | ontract and | d Bonds w | vere pre | sented to | o and mad | le a par | t of the | e records | of said | d meeting. | |
| Ι | further | certify the | hat | | | i: | s the | duly | qualifi | ed and a | acting |
| | | | _ of th | e Corp | oration a | nd tha | t said | vote ha | as not | been rep | ealed, |
| res | scinded or | amended | • | | | | | | | | |
| A | true copy | of the rec | ord, | | | | | | | | |
| | | | | ATTE | ST | | | | | | |

Clerk of the Corporation

(Corporate Seal)

Sworn to and subscribed to me this ____ day of _____, 20___.

Notary Public My Commission Expires:

Certificate of Acknowledgement of Contractor if a Corporation

for AGREEMENT

| County of) On this day of, 20, before me personally came to me known, who being by me duly sworn, did depose and say as follows: That he/she resides at and is the (title) of, the corporation described in and which executed the foregoing instrument; that he/she knows the corporate seal of said corporation; that the seal affixed to the foregoing instrument is such corporate seal and it was so affixed by order of the Board of Directors of said corporation; and that by the like order he/she signed thereto his/her name and official designation. | State of) |
|---|---|
| On this day of, 20, before me personally came to me known, who being by me duly sworn, did depose and say as follows: That he/she resides at and is the (title) of, the corporation described in and which executed the foregoing instrument; that he/she knows the corporate seal of said corporation; that the seal affixed to the foregoing instrument is such corporate seal and it was so affixed by order of the Board of Directors of said corporation; and that by the like order he/she signed thereto his/her name and official designation. | County of) |
| | On this day of, 20, before me personally came |
| as follows: That he/she resides atand is the(title) of, the corporation described in and which executed the foregoing instrument; that he/she knows the corporate seal of said corporation; that the seal affixed to the foregoing instrument is such corporate seal and it was so affixed by order of the Board of Directors of said corporation; and that by the like order he/she signed thereto his/her name and official designation. | to me known, who being by me duly sworn, did depose and say |
| That he/she resides at | as follows: |
| That he/she resides at | |
| and is the(title) of, the corporation described in and which executed the foregoing instrument; that he/she knows the corporate seal of said corporation; that the seal affixed to the foregoing instrument is such corporate seal and it was so affixed by order of the Board of Directors of said corporation; and that by the like order he/she signed thereto his/her name and official designation. | That he/she resides at |
| the corporation described in and which executed the foregoing instrument; that he/she knows the corporate seal of said corporation; that the seal affixed to the foregoing instrument is such corporate seal and it was so affixed by order of the Board of Directors of said corporation; and that by the like order he/she signed thereto his/her name and official designation. | and is the (title) of, |
| knows the corporate seal of said corporation; that the seal affixed to the foregoing instrument is such corporate seal and it was so affixed by order of the Board of Directors of said corporation; and that by the like order he/she signed thereto his/her name and official designation. | the corporation described in and which executed the foregoing instrument; that he/she |
| instrument is such corporate seal and it was so affixed by order of the Board of Directors of said corporation; and that by the like order he/she signed thereto his/her name and official designation. | knows the corporate seal of said corporation; that the seal affixed to the foregoing |
| said corporation; and that by the like order he/she signed thereto his/her name and official designation. | instrument is such corporate seal and it was so affixed by order of the Board of Directors of |
| designation. | said corporation; and that by the like order he/she signed thereto his/her name and official |
| | designation. |
| | |

Notary Public (Seal)

My Commission Expires: _____

Certificate of Acknowledgment of Contractor if a Corporation

FOR CONTRACT BONDS

| State of) |
|---|
| County of) |
| On this day of, 20, before me personally came |
| to me known, who being by me duly sworn, did depose and say |
| as follows: |
| |
| That he/she resides at |
| and is the (title) of, |
| the corporation described in and which executed the foregoing instrument; that he/she |
| knows the corporate seal of said corporation; that the seal affixed to the foregoing |
| instrument is such corporate seal and it was so affixed by order of the Board of Directors of |
| said corporation; and that by the like order he/she signed thereto his/her name and official |
| designation. |
| |

Notary Public (Seal)

My Commission Expires: _____

END OF SECTION 00600

c. 149 Projects

OWNER-CONTRACTOR AGREEMENT

THIS AGREEMENT made on ______ 20___, at Worcester, in the County of Worcester, Commonwealth of Massachusetts by and between______, (hereinafter called the Contractor) and the City of Worcester, a municipal corporation within said County of Worcester (hereinafter called the City).

WITNESSETH:

That the Contractor, in consideration of the payments hereinafter mentioned and of the fulfillment of the agreements herein mutually entered into, agrees with the City as follows:

SCOPE OF WORK:

(1) The Contractor shall, pursuant to the terms of this Agreement, provide all the supplies, materials and equipment, and perform all the labor, services and supervision necessary and proper to undertake and complete the ______, including Alternate(s)#_____ at _____

(hereinafter called the "Project") in the City of Worcester, Massachusetts, and to accomplish any and all work incidental thereto.

BONDS:

(2) The Contractor shall obtain and deposit with the City the following bond(s) in the amount of:

| PERFORMANCE BOND: | Dollars and no ce | ents |
|-------------------|-----------------------|------|
| | | |

(\$_____.00)

PAYMENT BOND:

(\$_____.00)

Dollars and no cents

with sureties satisfactory to the Contracting Officer to (a) guarantee the faithful performance by the Contractor of all its obligations under this Agreement and (b) constitute the security required by Massachusetts General Laws Chapter 149, Section 29, and Chapter 30, Section 39A, as amended, for the payment by the Contractor and its subcontractors for all labor performed or furnished and for all materials used or employed in connection with this Agreement.

CONTRACTING OFFICER:

(3) (a) Wherever used in this Agreement the term "Contracting Officer" shall mean the City official so designated below, or the individual duly appointed by him/her for the performance of any of his/her functions or responsibilities under this Agreement. The work under this Agreement shall be carried out under the direction and subject to the approval and acceptance of Paul J. Moosey, P.E., Commissioner, City of Worcester, Department of Public Works & Parks (hereinafter called the Contracting Officer).

(b) Anything to the contrary in the preceding paragraph notwithstanding, the City's contract compliance officer is and shall be a designee of the Contracting Officer for all notices, demands, sanctions and other communications relative to such officer's administration, monitoring and enforcement of the City's Minority/Women Enterprise Program and the Responsible Employer Ordinance. Each and every communication from the contract compliance officer directly to the Contractor shall be validly delivered notwithstanding any other contrary provision of this Agreement or other Contract Documents.

INCORPORATED DOCUMENTS:

(4) The performance of this Agreement is subject to the provisions of the following documents, all of which are attached hereto and intended to be an integral part of this Agreement (hereinafter periodically and collectively referred to as "the Contract Documents").

- (a) Information to Bidders
- (b) Bid Proposal, dated _____, 20___.
- (c) Specifications and Related Drawings

The Contract Documents are to be read collectively and complementary to one another; any requirement under one shall be as binding as if required by all. In the event of any conflict or inconsistency between the provisions of this Agreement and any of the other Contract Documents, the provisions of this Agreement shall prevail. In the event of any conflict or inconsistency between this Agreement, the other Contract Documents and any applicable state law, the applicable statutory provisions shall prevail. The Contract Documents set forth the entire legal relationship and requirements of the parties, as well as the technical requirements of the Project, and as such constitute the Contract, as hereinafter referred to.

TIME FOR PERFORMANCE:

(5) Time is of the essence for this Agreement. The Work of this Agreement shall be substantially completed no later than October 13, 2015. Final completion of the Work of this Agreement shall be no later than 30 days after the date of substantial completion. The Date of Substantial Completion shall remain the same, as stated above, regardless of any alternate(s) chosen to be included in the Contract by the Owner.

PRICE:

(6) The City will pay the Contractor for all materials delivered or furnished and for all the work performed pursuant to Article (1) hereof a sum of money as follows:

_____Dollars and no cents (\$_____.00)

PAYMENT:

(7) Payment to the Contractor shall be made by the City in accordance with General Laws Chapter 30, Section 39K, as amended, which is included in the Supplementary General Conditions to the Contract.

(a) The payment shall be in full for furnishing all materials, supplies, labor, services, supervision, tools and equipment and the use thereof as embraced under the Agreement, and except as may be provided under Article (10)(d), shall also constitute the payment for all loss or damage to the Contractor arising out of the nature of the work or from the action of the elements or from any unforeseen difficulties or obstructions which may arise or be encountered during the execution of the work until its final approval by the Contracting Officer, and for all risks to the Contractor of every description connected with the execution of the work or infringement of patents, trade marks, or copyrights and for completing the work in an acceptable manner.

(b) The payment of any periodic estimate or of any retained percentage shall in no way constitute an acceptance of the work or in no way prejudice or affect the obligation of the Contractor at his own cost or expense to repair, correct, renew, or replace any defects or imperfections in the construction as well as all damages due or attributable to such defects, nor shall any such payment for any current estimate or of any retained percentages prejudice or affect the rights of the City to hold the Contractor liable for breach of contract or to avail itself of the remedies under Article (15), hereof.

(c) If at any time there shall be evidence of any lien or other claim for which, if established, the City may become liable, directly or indirectly, and which is chargeable to the Contractor, the City may retain out of any payment then due or thereafter to become due, an amount sufficient to completely indemnify it against any such claim. If there prove to be any such claims after all the payments are made, the Contractor shall refund to the City all moneys that the City pays in discharging such claim in consequence of the Contractor's default.

(d) The Contractor, and each subcontractor, at every tier, to the Contractor, represents, warrants and certifies that it has complied with all laws of the Commonwealth of Massachusetts relating to taxes and all Ordinances and Orders of the City of Worcester relating to taxes, fees and charges, or is lawfully contesting the validity of the same. The Contractor, and each subcontractor, at every tier, further represents, warrants and certifies that it will remain in such compliance during the term of this Agreement, including any amendments or extensions hereto. Breach of any of these provisions shall be deemed a

material breach which shall entitle the City to immediately terminate this Agreement and take any other action authorized by law to collect any amounts due the City.

PAYMENT OF SUBCONTRACTORS:

(8) Payment to subcontractors shall be made in accordance with General Laws Chapter 30, Section 39F, as amended, which is included in the Supplementary General Conditions.

NOTICE:

(9) Wherever in this Agreement the City is to give or receive a notice, the Contracting Officer as defined in Article (3) shall be the City's Agent for such purpose.

PERFORMANCE:

(10) (a) The Contractor shall give his personal attention constantly to the faithful execution of the work and shall keep the same under his personal control. He shall not assign by power of attorney, or otherwise, the work or any part thereof without the previous written consent of the Contracting Officer. He shall not either legally or equitably assign any of the moneys payable under this Agreement or any claim thereto unless by and with like consent on the part of the Contracting Officer and the City Treasurer. He shall be responsible for all the acts and omissions of his employees and of all persons directly or indirectly employed by him in connection with the execution of this work.

(b) The Contractor shall provide sufficient and proper facilities at all times for the inspection of the work by the City. He shall, after receiving written notice that certain work or construction is improper, unsafe or defective or that such construction in any way fails to conform to the Contract Documents, forthwith remove such unsafe or defective construction and reconstruct the same in a manner satisfactory to the Contracting Officer. Upon failure of the Contractor to remedy the construction after being so notified, the Contracting Officer in accordance with Article 3.4.1 of the General Conditions may cause such defective work to be remedied or replaced and the City may deduct the cost thereof from any moneys due or to become due the Contractor.

(c) The City, acting through the Contracting Officer, or the project Architect, shall have the authority to suspend the work wholly or any part thereof for such period as deemed necessary due to failure of the Contractor to carry out orders given or to perform any provision of the Agreement. Upon receipt of written order from the Contracting Officer or Architect, the Contractor shall immediately suspend the work or such part thereof in accordance with the order. No work shall be suspended without the written permission of the Contracting Officer or Architect. The work shall be resumed when conditions so warrant or deficiencies have been corrected and the condition of the Contract satisfied as ordered or approved in writing by the Contracting Officer or Architect. No allowance of any kind will be made for suspension of work by order of the Contracting Officer or Architect pursuant to this paragraph.

(d) Any request for an adjustment in the contract price by the Contractor or the City, due to differing subsurface or latent physical conditions, shall be governed by the provisions of General Laws Chapter 30, section 39N, as amended, which is included in the Supplementary General Conditions.

(e) The Contractor agrees that it shall have no claim for damages of any kind on account of any delay in commencement of the work. Post commencement, the Contractor shall have no claim for damages of any kind on account of any delay or suspension of any portion of the work except as hereinafter provided. Adjustments, if any, in the contract price due to a suspension, delay, interruption or failure to act by the City shall be governed by the provisions of General Laws Chapter 30, section 39(O), as amended, which is included in the Supplementary General Conditions. Provided, however, the provisions of this paragraph shall not apply to any suspension pursuant to Section (10)(c), or for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this Agreement provides for an equitable adjustment of the contract price, or time, under any other provision. Provided, further, that no adjustment shall be made if the performance of the Contractor would have been prevented by other causes, even if the work had not been so suspended, delayed or interrupted by the City. Provided, further, that a subcontractor shall have the same rights against the Contractor for payment for an increase in the cost of his performance as the provisions of this paragraph gives the Contractor against the City, but nothing herein shall in any way change, modify or alter any other rights which the Contractor and subcontractor may have against each other.

(f) The City may award other contracts for additional work. The Contractor shall cooperate fully with other contractors and carefully fit his own work to that of other contracts as may be directed by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor.

(g) The Contractor shall comply with all the laws, state and federal, applicable to the work and construction provided for herein. This Agreement is made subject to all laws, state and federal; and if any clause hereof does not conform to such law, then such clause shall be void and the law operative shall be inserted in lieu thereof. Any violation by the Contractor of state or federal laws relating to the employment of labor upon the work or the construction contemplated by this Agreement shall be a sufficient cause for the City to cancel the Agreement without in any way being liable in damages therefor. Should the City cancel the Agreement because of the failure on the part of the Contractor to observe the state or federal laws, or the rules and regulations relating to employment of labor upon the work herein contemplated, then upon cancellation the City reserves all rights and benefits herein or by law provided against the Contractor for the breach of the conditions of this Agreement.

(h) It shall be a material breach of this Agreement if the Contractor and each subcontractor shall not at all times adhere to the provision of 1A(e)(9) of chapter nine of the Revised Ordinances of the city by limiting their on-site, noise producing construction and related work to the hours specified by said ordinance.

(i) When the use of explosives is necessary for the execution of the work, the Contractor shall take the utmost care not to endanger life and property. Whenever directed, the number and size of the charges shall be reduced. All explosives shall be stored in a places shall be secure manner. All such storage marked clearly "DANGEROUS-EXPLOSIVES", and shall be in the care of competent watchmen at all times. The method of storage and handling explosives and highly inflammable materials shall conform to all the state laws and regulations, as well as any local requirements.

(j) Upon the completion of the work the Contractor shall, at his own expense, remove all equipment, temporary Contractor's buildings and sheds, fencing, rubbish and waste material in and about the area that has been worked and he shall leave the premises and the work performed all in a neat and proper condition.

(k) Before commencing the work the Contractor shall, if required, submit a schedule of operations for approval of the Contracting Officer or Architect. The schedule shall show the methods and order of operations that the Contractor proposes to use. The approval of the schedule by the Contracting Officer or Architect shall not be construed as relieving the Contractor from any responsibility.

(1) Should the Contractor be obstructed or delayed in the execution of the work as a result of damage which may be caused by lightning, earthquake, rain, storm, or cyclone, then the time fixed for completion may be extended for a period equivalent to the time lost by reason of any of the foregoing causes. No such extension shall be made unless a claim therefor is presented in writing to the Contracting Officer within forty-eight (48) hours of the occurrence of such delay. The Contractor shall have no claim against the City for damages on account of such delay. The duration of the extension itself must be certified to by the Contracting Officer or Architect.

ADDITIONAL WORK:

(11) (a) The Contractor agrees to perform any work related to the subject matter of the Contract, but not within its original scope, upon written order of the Contracting Officer or Architect, the payment for such extra work to be made in accordance with whichever of the following methods the Contracting Officer elects: (i) a price agreed upon between the parties and stipulated in the order for the extra work; or (ii) a price based on the unit prices of the contract; or (iii) a price determined to be the reasonable cost of the extra work as computed by the Contracting Officer in accordance with paragraph (b) below.

(b) In computing reasonable cost for the purposes of (iii) above, the Contracting Officer shall include the reasonable cost to the Contractor,

(i) of the cost of prevailing rates for direct labor, material, and use of equipment;

(ii) plus the cost of worker's compensation insurance, liability insurance, federal Social Security insurance, and Massachusetts unemployment compensation

insurance or, as an alternative, the Contractor may elect to use a flat twenty-five percent (25%) of the total labor rate in (a);

(iii) plus ten percent (10%) of the total labor rate in (a) for overhead, superintendence and profit, which will be paid to the Contractor for Item 1 work, which is the work of the Contractor and all its non-filed subcontractors. On Item 2 work, which is the work of filed subcontractors, this ten percent (10%) will be allowed only to the filed subcontractor and is not applicable to any Paragraph E sub-subcontractors. The Contractor or the filed subcontractor, as the case may be, shall agree upon the distribution of the ten percent (10%) to their respective subcontractors as a matter of contract therewith;

(iv) for work performed by a filed subcontractor, the Contractor shall accept an additional five percent (5%) of the filed subcontractor's price (less the 10% mark-up), as full compensation for processing forms and assuming full responsibility for the faithful performance of such work by the filed subcontractor(s);

(v) plus actual direct premium costs of payment and performance bonds required of the Contractor and filed subcontractors, provided there will be an appropriate credit for premiums for a credit change order; and

(vi) if the extra work requires the use of heavy equipment, cranes and hoisting equipment, machinery, and special tools not on site and not originally required to be used upon the work, then the cost of transportation to and from the work site, not exceeding 100 miles, shall be included. The cost of extra work shall not include any cost or rental of small tools, buildings, or any portion of the time of Contractor's management or office personnel, or any allowance for use of capital.

(c) The Contracting Officer or Architect may make alterations in the line, grade, plan, form, dimensions, or materials of the subject matter of the Contract, or any part thereof, either before or after commencement of construction. Where such alterations increase the quantity or standard of the work to be done, payment for such increase shall be made in the same way that payment is made for extra work under (a) and (b) above. Where such alterations diminish the quantity or standard of the work to be done, an adjustment shall be made to the benefit of the City based upon the unit prices where used or, where unit prices are not used, as the Contracting Officer shall determine.

EMPLOYMENT:

(12) (a) The Contractor shall employ competent workers and if notified by the Contracting Officer, in writing, that any person engaged upon the work is incompetent, unfaithful, disorderly or otherwise unsatisfactory, then such worker shall be discharged from the work.

(b) In the performance of this Agreement, the Contractor shall comply with the provisions of Worcester Revised Ordinances Chapter 2, Section 35 as amended, which are included in the Supplemental General Conditions to the Contract.

(c) The parties shall comply with the provisions of section 179A of Chapter 149 of the Gen. Laws (Ter. Ed.). Notwithstanding any provisions to the contrary contained in the General or Supplemental Conditions to the Contract, in the employment of persons including mechanics, teamsters, chauffeurs and laborers, under this Contract, preference shall be given:

- First: To citizens of the Commonwealth who are residents of the City of Worcester and who have served in the Armed Forces of the United States in time of war and have been honorably discharged therefrom or released from active duty therein, and who are qualified to perform the work to which the employment relates.
- Second: To citizens of the Commonwealth who are residents of the City of Worcester and are qualified to perform the work to which the employment relates.
- Third: 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 therefrom or released from active duty therein and who are qualified to perform the work to which the employment relates.
- Fourth: To citizens of the Commonwealth generally.
- Fifth: To citizens of the United States.

The foregoing provisions shall not apply to those persons employed in a supervisory capacity. In so far as practicable preference is to be given Worcester Truckers in hauling materials.

(d) No laborer, worker, mechanic, foreman, or inspector working within the Commonwealth of Massachusetts in the employ of the Contractor, sub-contractors, or other persons doing or contracting to do the whole or part of the work contemplated by this Agreement, shall be required or permitted to work more than eight (8) hours in any one (1) calendar day; or more than forty-eight (48) hours in one (1) week, or more than six (6) days in any one (1) week in full compliance with provisions of G.L. c. 149, s. 34, except in cases of emergency.

(e) Every employee in the work covered by the Contract shall lodge, board and trade where and with whom he elects and neither the Contractor nor his agents or employees shall directly or indirectly require as a condition of employment therein that an employee shall lodge, board or trade at a particular place or with a particular person.

(f) The Contractor shall provide and maintain in a neat and sanitary condition such accommodations for the use of his employees as may be necessary to comply with the requirements of the Department of Public Health, local health officials or of other appropriate authorities. The maintenance of all sanitary facilities shall be subject to the laws of the Commonwealth and to the rules and regulations of the State Board of Health and of the Commissioner of Public Health for the City of Worcester.
(g) The Contractor shall, before commencing the work, provide by insurance for the payment of compensation and the furnishing of other benefits under Chapter 152 of the General Laws to all persons employed under the Agreement, and he shall continue such insurance in force and effect during the term hereof. The City may require the Contractor to deliver certificates of insurance as sufficient proof of compliance with the foregoing. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the Agreement and shall entitle the City to terminate the Agreement without in any way being liable in damages therefor.

(h) The Contractor shall keep a true and accurate register of all mechanics, teamsters, chauffeurs and laborers employed upon the work contemplated by this Contract, showing the name, address and occupational classification of each such employee, the hours worked by and the wages paid to each such employee, and shall furnish the Massachusetts Department of Labor and Industries, upon its request, a true statement thereof.

(i) Minimum wage rates under the provisions of General Laws chapter 149, section 27, as amended, have been determined by the Commissioner of Labor and Industries for the Commonwealth, and the Contractor shall in the payment of wages be bound by them during the life of the Agreement. The applicable schedule of minimum wage rates, as so determined, are incorporated elsewhere within the Contract Documents.

TERMINATION:

(13) (a) If the Contractor shall be adjudged as bankrupt, or if he shall make a general assignment for the benefit of his creditors, or if a receiver of his property shall be appointed, or if the work to be done under the Agreement shall be abandoned, or if the Agreement or any part of shall be sublet without the previous written consent of the Contracting Officer, or if the Contract or any claim hereunder shall be assigned by the Contractor otherwise than as herein specified, or if at any time the Contracting Officer shall be of the opinion that the work, or any part thereof, is unnecessarily or unreasonably delayed, or that the Contractor has violated any of the provisions of the Agreement, the Contracting Officer, for and in behalf of the City, may notify the Contractor to discontinue all work, or any part thereof; and thereupon the Contractor shall discontinue such work or such part thereof as the Contracting Officer directs, and the City may thereupon, by contract or otherwise, as it may determine, complete the work, or such part thereof, and charge the entire expense of so completing the work or any part thereof to the Contractor.

(b) If the Contracting Officer or Architect shall certify by written notice to the Contractor that the rate of progress is not satisfactory, the City may, instead of notifying the Contractor to discontinue all of the work or any part thereof, notify him from time to time to increase the force, equipment and plant, or any of them, employed on the whole or any part of the work, stating the amount of increase required. Unless the Contractor shall, within seven (7) work days after such notice, increase his force, equipment and plant to the extent required therein, and maintain and employ the same from day to day until the

completion of the work or such part thereof or until the conditions as to the rate of progress shall, in the opinion of the Contracting Officer or Architect, be fulfilled, the City may employ and direct the labors of such additional force, equipment and plant as may, in the opinion of the Contracting Officer or Architect, be necessary to ensure the completion of the work or such part thereof within the time specified or at the earliest possible date thereafter, and charge the expense thereof to the Contractor. Neither the notice from the Contracting Officer or Architect to the Contractor to increase his force, equipment or plant nor the employment of additional force, equipment or plant by the City shall be held to prevent a subsequent notice to the Contractor from the City to discontinue the work under the provisions of the preceding portion of this Article.

(c) All expenses charged under this Article shall be deducted by the City out of moneys then due or to become due the Contractor under this Agreement, or any part hereof. In such accounting the City shall not be obligated to obtain the lowest figures for the work of completing the contract or any part thereof, or for insuring its proper completion, and all sums actually paid by the City shall be charged to the Contractor. If the expense so charged is greater than the sum which would have been payable under the Agreement, if the same had been completed by the Contractor, then the Contractor shall pay the amount of the excess to the City upon completion of the work and without further demand being made therefor.

(d) The Contractor shall not be relieved of liability to the City by virtue of any termination of this Agreement and any claim for damages against the Contractor relating to the Contractor's performance hereunder shall survive any termination hereunder.

GUARANTEES:

(14) (a) The Contractor guarantees the work under this Contract and the materials furnished by him for use in connection therewith to be free from defects or flaws for one (1) year after the completion of the work, unless a greater period of time is prescribe by law, or by terms of any special guarantee required under any other provisions of the Contract Documents. It is expressly understood, however, that this guarantee provision shall not absolve the Contractor from any liability to the City arising out of a failure to substantially comply with the terms of the Agreement.

(b) If at any time within said guaranty period, any part of the work constructed under the terms of this Agreement shall, in the opinion of the Contracting Officer or Architect, require repairing due to defective work or materials furnished by the Contractor, he may notify the Contractor in writing to make the required repairs. If the Contractor shall neglect to start such repairs within ten (10) work days of the date of giving him notice thereof and to complete the same to the satisfaction of the Contracting Officer or Architect with reasonable dispatch, then the latter may employ other persons to make such repairs. The City shall charge the expense thereof to the Contractor and may use any moneys still retained to pay for the same, and if such sum is insufficient, the Contractor shall be obligated to pay the balance thereof.

INDEMNIFICATION:

(15) (a) The Contractor shall indemnify and save harmless the City of Worcester and all of its officers, agents and employees against all suits, claims or liability of every name, nature, and description arising out of or in consequence of the acts or omissions of the Contractor in the performance of the work covered by the Agreement and/or his failure to comply with the terms and conditions hereof, and will at his own cost and expense defend any and all such suits and actions.

(b) The Contractor shall bear all losses resulting from the use or storage of explosives and highly inflammable materials, and shall save the City harmless from all claims for bodily injuries or death to any person and from all claims for property damage or destruction arising out of the use or storage of explosives and highly inflammable materials.

(c) The Contractor further covenants to hold and save the City, its officers, servants and employees harmless from and against all and every demand or demands, of any nature or kind for or on account of the use of any patented invention, article or appliance included in the materials and equipment agreed to be furnished, supplied or used under this Agreement.

INSURANCE:

(16) (a) The Contractor shall carry public liability insurance with an insurance company satisfactory to the City so as to save the City harmless from any and all claims for damages arising out of bodily injury to, or death of, any person or persons and for all claims for damages arising out of injury to, or destruction of, property caused by accidents resulting from the use of implements, equipment or labor used in the performance of the Agreement or from any neglect, default omission or want of proper care or misconduct on the part of the Contractor or of any one in his employ during the execution of the work. Such insurance shall include coverage for blasting and explosion, if explosives are to be used.

(b) The Contractor shall carry any other types of insurance as may be required elsewhere in the Contract Documents. All insurance policies required in the Contract Documents shall be provided by companies satisfactory to the City.

(c) Prior to starting work under this Agreement, the Contractor shall deposit, with the City's Law Department, certificates from the insurers to the effect that the insurance policies required in the above paragraphs have been issued to the Contractor. The certificates must be on a form satisfactory to the Law Department.

(d) Unless greater amounts of insurance coverage are required elsewhere in the Contract Documents, the amounts of such public liability insurance shall not be less than the minimum amounts set forth below:

Liability for bodily injury, including accidental death, \$250,000.00 for any one person and, subject to the same limit for each person, \$500,000.00 on account of one accident.

- (ii) Liability for property damage, \$100,000.00 on account of any one accident and \$300,000.00 on account of all accidents.
- (iii) Workers' compensation/employers' liability MA statutory requirements.

(e) Unless greater amounts of insurance coverage are required elsewhere in the Contract Documents, the Contractor shall also carry bodily injury and property damage insurance in amounts not less than those set forth above, covering the operation of all motor vehicles owned by the Contractor and engaged in this work.

(f) No cancellation of any insurance whether by the insurer or by the insured shall be effective unless written notice thereof is given to the City at least fifteen (15) days prior to the intended effective date thereof, which date has been expressed in the notice. Prior to the effective date of any such cancellation the Contractor shall take out new insurance to cover the policies so cancelled. The Insurance Companies shall remain liable, however, until new and satisfactory insurance policies have been delivered to, and accepted by, the City.

CONFLICT OF INTEREST:

(17) (a) The Contractor warrants that he has complied with all provisions of law regarding the award of this Contract and that he, or his employees, agents, officers, directors or trustees have not offered or attempted to offer anything of any value to any employee of the City in connection herewith.

(b) The Contractor further warrants that no elected official or employee of the City of Worcester, including unpaid members of City boards and commissions, serves as an officer, director, trustee or employee of Contractor, and that no elected officials or employees of the City of Worcester have or will have a direct or indirect financial interest in this Agreement. The foregoing shall not apply, however, if the Contractor qualifies for an exemption and complies with the applicable disclosure provision(s) under G. L. c. 268A.

(c) Violation of this Article shall be a material breach of this Agreement and shall be grounds for immediate termination hereof by the City without regard to any enforcement activities undertaken or completed by any enforcement agency. Termination of this Agreement pursuant to this Article shall not waive any claims for damages the City may have against the Contractor resulting from the Contractor's violation of the terms of this Article.

SEVERABILITY:

(18) If any provision of this Agreement is held invalid by any court or body of competent jurisdiction, the remainder of this Contract shall remain in full force and effect.

HEADINGS:

(19) The section headings in this Agreement are for convenience and reference only and in no way define or limit the scope or content of this Agreement or in any way affect its provisions.

AMENDMENTS:

(20) This Agreement may be amended or modified only by written instrument duly executed by the parties.

ENTIRE AGREEMENT:

(21) This Agreement contains the entire understanding of the parties and supercedes all prior agreements, representations, proposals and undertakings of the parties.

IN WITNESS WHEREOF the Contractor has hereunto set his hand and seal and the City has caused its corporate seal to be hereto affixed and this Agreement to be executed in its name and behalf by a duly authorized officer thereof the day and year first above written.

CITY OF WORCESTER

RECOMMENDED:

CONTRACTOR

BY: _____(SEAL)

Paul J. Moosey P.E. Commissioner Department of Public Work & Parks

APPROVED AS TO LEGAL FORM:

CERTIFICATION OF FUNDING

I certify that an appropriation of funds in the amount of this Agreement is contained in account number _____.

Robert V. Stearns City Auditor

APPROVED:

Edward M Augustus Jr. City Manager

PAYMENT BOND

KNOW ALL BY THESE PRESENTS, that _____, a _____ corporation duly established by law and having a usual place of business at _____ as PRINCIPAL, and_____, a corporation organized under the laws of the State or Commonwealth of _____, and duly authorized and admitted, under the provisions of Chapter 175 of the Massachusetts General Laws, as amended, to transact the business of a fidelity and surety company in Massachusetts, as SURETY, are held and firmly bound unto the City of Worcester, a municipal corporation within the Commonwealth of Massachusetts. in the sum of Dollars and no cents (\$.00) lawful money of the United States of America, to be paid to the City of Worcester, its successors and assigns, to the payment of which, well and truly to be made, the **PRINCIPAL** and the SURETY bind themselves, their respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said <u>PRINCIPAL</u> has entered into an Agreement of even date herewith with the City of Worcester, said Agreement being for the ______ at _____ in the City of Worcester, Massachusetts:

NOW THEREFORE, the condition of this obligation is such that if the <u>PRINCIPAL</u> shall pay for all labor performed or furnished and for all materials used or employed or any appliance and equipment used or employed or rented or hired out in the execution of said Agreement and in any and all duly authorized modifications, alterations, extensions of time, changes or additions to said Agreement that may hereafter be made, notice to the <u>SURETY</u> of such modifications, alterations, extensions of time, changes or additions being hereby waived, the foregoing to include any other purposes or items set out in, and to be subject to, the provisions of Massachusetts General Laws, Chapter 149, Section 29 and Chapter 30, Section 39A, as amended, then this obligation shall become null and void; otherwise it shall remain in full force and virtue.

IN TESTIMONY WHEREOF, the <u>PRINCIPAL</u> has hereunto caused its name and seal to be affixed, and the <u>SURETY</u> has caused its corporate seal to be hereunto affixed by a duly authorized officer thereof and this instrument to be executed and delivered in its name and behalf by its attorney-in-fact, duly authorized by its by-laws and votes, powers of attorney, and letters of appointment and authorization, certificated copies of which documents are annexed to this bond and may be introduced in evidence as if a part hereof.

| (PRINCIPAL) | (SEAL) |
|-------------|--------|
| · / _ | · / |

By:_____

(SURETY) (SEAL)

Attorney-in-Fact

PERFORMANCE BOND

KNOW ALL BY THESE PRESENTS, that _______, a______ corporation duly established by law and having a usual place of business at_______ as <u>PRINCIPAL</u>, and________, a corporation organized under the laws of the State or Commonwealth of_______, and duly authorized and admitted, under the provisions of Chapter 175 of the Massachusetts General Laws, as amended, to transact the business of a fidelity and surety company in Massachusetts, as <u>SURETY</u>, are held and firmly bound unto the City of Worcester, a municipal corporation within said Commonwealth of Massachusetts, in the sum of \$______Dollars and no cents (\$______.00) lawful money of the United States of America, to be paid to said City of Worcester, its successors and assigns, to the payment of which, well and truly to be made, the <u>PRINCIPAL</u> and the <u>SURETY</u> bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said <u>PRINCIPAL</u> has entered into an Agreement of even date herewith with the City of Worcester, said Agreement being for the ______, inclusive, at ______ in the City of Worcester, Massachusetts;

NOW THEREFORE, the condition of this obligation is such that if the said <u>PRINCIPAL</u> shall well and faithfully perform all the terms and conditions of said Agreement on its part to be kept and performed as therein stipulated, including guarantee and maintenance provisions therein, and shall pay for all materials furnished and for all labor performed in the execution of said Agreement, and shall indemnify and save harmless the said City of Worcester as therein stipulated, then this obligation shall be of no effect; otherwise it shall remain in full force and virtue.

And the said <u>SURETY</u>, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of said Agreement, or to the work to be performed thereunder, or to the specifications accompanying the same, shall in any way effect its obligation on this bond; and it does hereby waive notice of any change, extension of time, alterations or additions to the terms of said Agreement, or to the work, or to the specifications.

In the event that the Agreement is abandoned by the Contractor, or is terminated by the City of Worcester, under the provisions thereof, said <u>SURETY</u> hereby further agrees that it shall, if requested in writing by the City of Worcester, take such action as is necessary to complete said Agreement.

IN TESTIMONY WHEREOF, the <u>PRINCIPAL</u> has hereunto caused its name and seal to be affixed, and the <u>SURETY</u> has caused its corporate seal to be hereunto affixed by a duly authorized officer thereof and this instrument to be executed and delivered in its name and behalf by its attorney-in-fact, duly authorized by its by-laws and votes, powers of attorney, and letters of appointment and authorization, certificated copies of which documents are annexed to this bond and may be introduced in evidence as if a part hereof.

(PRINCIPAL) (SEAL)

By: _____

(SURETY)_____(SEAL)

Attorney-in-Fact

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:

DATE: _____

Pursuant to Mass. G.L. c. 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 & No. | | |
| | | Signature of Individual |
| | | or Corporate Officer (if applicable) |
| City or Town | Tel No. | |
| STATE | Zip Code | |
| SOCIAL SECURITY NUMB | ER | |

FEDERAL IDENTIFICATION NUMBER

CERTIFICATE OF VOTE OF AUTHORIZATION

Date _____

| I hereby certify that at a meeting of the Board of Directors of |
|--|
| duly called and held on the day of |
| , 20, at which time it was voted that (name), |
| (title) be and hereby is authorized to execute and deliver for and in |
| behalf of the corporation, a contract with the City of Worcester for |
| (the "Project") in the City of Worcester and, as Principal to |
| execute a Performance Bond and Labor and Materials Bond in connection therewith, which |
| Contract and Bonds were presented to and made a part of the records of said meeting. |
| I further certify that is the duly qualified and acting |
| of the Corporation and that said vote has not been repealed, |
| rescinded or amended. |
| A true copy of the record, |

ATTEST

Clerk of the Corporation

(Corporate Seal)

Sworn to and subscribed to me this ____ day of _____, 20___.

Notary Public My Commission Expires:

Certificate of Acknowledgement of Contractor if a Corporation

for AGREEMENT

| State of |) |
|------------------|---|
| County of) | SS) |
| On this day of _ | , 20, before me personally came |
| to me l | known, who being by me duly sworn, did depose and say |
| as follows: | |

| That he/she resides at | | | |
|------------------------|--|--|--|
| | | | |
| | | | |

| and is the | (title) of |
|------------|------------|
| | |

the corporation described in and which executed the foregoing instrument; that he/she knows the corporate seal of said corporation; that the seal affixed to the foregoing instrument is such corporate seal and it was so affixed by order of the Board of Directors of said corporation; and that by the like order he/she signed thereto his/her name and official designation.

Notary Public (Seal)

My Commission Expires: _____

Certificate of Acknowledgment of Contractor if a Corporation

FOR CONTRACT BONDS

| State of |) | | |
|----------------------------|--------------|-------------------------------|------------------------------|
| County of |) | 88 | |
| On this day | of | , 20, be | efore me personally came |
| | to me kno | wn, who being by me duly | sworn, did depose and say |
| as follows: | | | |
| | | | |
| That he/she reside | s at | | |
| and is the | | (title) of | , |
| the corporation described | l in and v | hich executed the foregoin | ng instrument; that he/she |
| knows the corporate sea | ul of said | corporation; that the seal | affixed to the foregoing |
| instrument is such corpora | ate seal and | it was so affixed by order of | of the Board of Directors of |
| said corporation; and that | by the like | order he/she signed theret | o his/her name and official |
| designation. | | | |

Notary Public (Seal)

My Commission Expires: _____

END OF SECTION 00600



CITY OF WORCESTER

FORM OF SUBCONTRACT

| (Revised 1/6/ | 93) | | |
|--------------------------|---|--|--|
| | | CONTRACT | |
| THIS AGREE | EMENT made this | day of | , 20, |
| by and between | en | | |
| (a Corpor (a Partner | ation organized and existing ship consisting of | g under the laws of |), |
| (an Indivi | dual doing business as | |), |
| hereinafter ca | lled the "Contractor", | | |
| and | · · · · · · · · | | |
| (a Corpor | ation organized and existing | g under the laws of |), |
| (a Farther (an Indivi | dual doing business as | |), |
| hereinafter ca | lled the "Subcontractor". | | |
| WITNESSET agree as follo | H, that the Contractor and tws: | he Subcontractor for the consider | rations hereafter named, |
| 1. The S all we | Subcontractor agrees to furn ork specified in Section No. | ish all labor and materials require | ed for the completion of of the specifications for |
| draw | ings referred to therein and | addenda Nos,, | , andfor the |
| (comp as pr Parks | blete title of the project and th epared by Clark C. Burrit , Architectural Services, Wo | e project number taken from title pa t, Principal Architect, Departme orcester, MA 01605, for the sum (\$ | age of the project manual) ent of Public Works & of) and |
| the C | ontractor agrees to pay the S | Subcontractor said sum of said we | ork. |
| a) | The Subcontractor agree hereinbefore described d stated therein) and adden to the Contractor all the | es to be bound to the Contract lrawings, specifications (includin ida Nos,,,, | or by the terms of the g all general conditions and, and to assume that the Contractor by |

(hereinafter called the "Awarding Authority"), except to the extent that

those documents assumes to

provisions contained therein are by their terms or by law applicable only to the Contractor.

- b) The Contractor 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 Contractor, except to the extent that provisions contained therein are by their terms or by law applicable only to the Awarding Authority.
- Anything contained herein to the contrary notwithstanding, to the fullest extent c) allowed by law, the Subcontractor shall indemnify and hold harmless the Contractor, Architect, and Awarding Authority, their agents and employees, from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from the performance of the work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting there from and (2) is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. 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 provision.
- 2. The Contractor 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 Contractor, 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 Contractor 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 Contractor.
- 4. The Contractor agrees that no claim for services rendered or materials furnished by the Contractor to the Subcontractor shall be valid unless written notice thereof is given by the Contractor to the Subcontractor during the first ten (10) days of the calendar month following that in which the claim originated.
- 5. This agreement is contingent upon the execution of a general contract between the Contractor and the Awarding Authority for the complete work.
- 6. Responsible Employer Ordinance:

a) The performance of the work derived from this contract is subject to the city's Responsible Employer Ordinance, Chapter 2, Section 35 of the Worcester Revised Ordinance (2008).

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 Contractor)

By:_____

END OF SECTION

SECTION 00800 – PREVAILING WAGE RATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections are hereby made a part of this Section.

1.2 SUMMARY

- A. This Section specifies the List of Jobs; Classifications; Determination of Rate of Wages; Schedule: as established under Statutory reference: M.G.L. Chapter 149, Section 26 and 27. These requirements apply to every contract or subcontract performing work on this public works project.
- B. Related Sections: Sections which contain requirements that relate to this Section include, but are not limited to the following:
 - 1. Section 00150
 - 2. Section 00950
 - 3. Section 01230
 - 4. Section 01300
 - 5. Section 01700
- C. 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 indicated in Supplementary Conditions section 00300, 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 work 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.
- D. Every Contractor and Sub-Contractor at any and all tiers shall complete the "WEEKLY PAYROLL REPORT FORM" and submit a copy to the Contract Compliance Office (indicated below) for each week **consecutively**, after the start of that trades work.
- E. "WEEKLY PAYROLL REPORTS" shall be required to be submitted **consecutively**, for each week from the start of work until the completion of his work, regardless of whether work was actually being performed on or off-site.
 - 1. When work is not performed; indicate on the form the corresponding week ending dates and post "NO WORK PERFORMED" conspicuously on the front of said form.

2. Weekly reports shall be required until the contractor executes and furnishes to the Department of Labor and Workforce Development/Division of Occupational Safety the final "STATEMENT OF COMPLIANCE" bound herein.

F. SUBMIT TO:

Kenrick Haywood, Contract Compliance Officer City Hall, Room 404 455 Main Street Worcester, MA 01608 508-799-1174 Fax 508-799-1244

1.3 SAMPLE FORMS FOLLOW THIS PAGE.

A. Final form and format shall be as approved by the Contract Compliance Office.

| Ô |
|------------------|
| DEVAL L. PATRICK |

0.000

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 RACHEL RAFREILAN Soota 7 HEATHER E. ROWE Du taas

| Awarding Authority: | City of Worcester | | |
|----------------------|--|------------------|---------------------|
| Contract Number: | 1004 | City/Town: | WORCESTER |
| Description of Work: | Regional Emergency Communications Center - Construct new | r Emergency Comm | unications Building |
| Job Location: | 2 Coppage Street Worcester, MA 01603 | | |

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 Division of Apprentice Standards (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. If an apprentice rate is not listed on the prevailing wage schedule for the trade in which an apprentice is registered with the DAS, the apprentice 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
criminal penalties.

Issue Date: 11/03/2014

Wage Request Number: 20141103-008

REGIONAL EMERGENCY COMMUNICATIONE CENTER

| Classification | | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------------|----------------|-----------|---------|---------|------------------------------|--------------|
| Construction | | | | | | | |
| (2 AXLE) DRIVER - EQUIPMENT | | 08/01/2014 | \$31.30 | \$9.91 | \$8.80 | \$0.00 | \$50.01 |
| TEARSTERS JOINT COONCIL NO. TO ZONE B | | 12/01/2014 | \$31.30 | \$9.91 | \$9.33 | \$0.00 | \$50.54 |
| | | 06/01/2015 | \$31.65 | \$9.91 | \$9.33 | \$0.00 | \$50.89 |
| | | 08/01/2015 | \$31.65 | \$10.41 | \$9.33 | \$0.00 | \$51.39 |
| | | 12/01/2015 | \$31.65 | \$10.41 | \$10.08 | \$0.00 | \$52.14 |
| | | 06/01/2016 | \$32.15 | \$10.41 | \$10.08 | \$0.00 | \$52.64 |
| | | 08/01/2016 | \$32.15 | \$10.91 | \$10.08 | \$0.00 | \$53.14 |
| | | 12/01/2016 | \$32.15 | \$10.91 | \$10.89 | \$0.00 | \$53.95 |
| (3 AXLE) DRIVER - EQUIPMENT | | 08/01/2014 | \$31.37 | \$9.91 | \$8.80 | \$0.00 | \$50.08 |
| TEAMSTERS JOINT COUNCIL NO, 10 ZONE B | | 12/01/2014 | \$31.37 | \$9.91 | \$9.33 | \$0.00 | \$50.61 |
| | | 06/01/2015 | \$31.72 | \$9.91 | \$9.33 | \$0.00 | \$50.96 |
| | | 08/01/2015 | \$31.72 | \$10.41 | \$9.33 | \$0.00 | \$51.46 |
| | | 12/01/2015 | \$31.72 | \$10.41 | \$10.08 | \$0.00 | \$52.21 |
| | | 06/01/2016 | \$32.22 | \$10.41 | \$10.08 | \$0.00 | \$52.71 |
| | | 08/01/2016 | \$32.22 | \$10.91 | \$10.08 | \$0.00 | \$53.21 |
| | | 12/01/2016 | \$32.22 | \$10.91 | \$10.89 | \$0.00 | \$54.02 |
| (4 & 5 AXLE) DRIVER - EQUIPMENT | | 08/01/2014 | \$31.49 | \$9.91 | \$8.80 | \$0.00 | \$50.20 |
| TEAMSTERS JOINT COUNCIL NO. 10 ZONE B | | 12/01/2014 | \$31.49 | \$9.91 | \$9.33 | \$0.00 | \$50.73 |
| | | 06/01/2015 | \$31.84 | \$9.91 | \$9.33 | \$0.00 | \$51.08 |
| | | 08/01/2015 | \$31.84 | \$10.41 | \$9.33 | \$0.00 | \$51.58 |
| | | 12/01/2015 | \$31.84 | \$10.41 | \$10.08 | \$0.00 | \$52.33 |
| | | 06/01/2016 | \$32.34 | \$10.41 | \$10.08 | \$0.00 | \$52.83 |
| | | 08/01/2016 | \$32.34 | \$10.91 | \$10.08 | \$0.00 | \$53.33 |
| | | 12/01/2016 | \$32.34 | \$10.91 | \$10.89 | \$0.00 | \$54.14 |
| ADS/SUBMERSIBLE PILOT | | 08/01/2014 | \$87.36 | \$9.80 | \$18.17 | \$0.00 | \$115.33 |
| PILE DRIVER LOCAL 56 (ZONE 2) | | 08/01/2015 | \$90.51 | \$9.80 | \$18.17 | \$0.00 | \$118.48 |
| AIR TRACK OPERATOR | | 06/01/2014 | \$31.10 | \$7.30 | \$12.10 | \$0.00 | \$50,50 |
| LABORERS - ZONE 2 | | 12/01/2014 | \$31.60 | \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | | 06/01/2015 | \$32.10 | \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | | 12/01/2015 | \$32.60 | \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | | 06/01/2016 | \$33.10 | \$7.30 | \$12.10 | \$0.00 | \$52.50 |
| | | 12/01/2016 | \$33.85 | \$7.30 | \$12.10 | \$0.00 | \$53.25 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | | |
| ASBESTOS WORKER (PIPES & TANKS) | | 06/01/2014 | \$31.58 | \$10.40 | \$5.95 | \$0.00 | \$47.93 |
| HEAT & FROST INSULATORS LOCAL 6 (WORCESTER) | | 12/01/2014 | \$32.48 | \$10.40 | \$5.95 | \$0.00 | \$48.83 |
| | | 06/01/2015 | \$33.43 | \$10.40 | \$5.95 | \$0.00 | \$49.78 |
| | | 12/01/2015 | \$34.38 | \$10.40 | \$5.95 | \$0.00 | \$50.73 |
| ASPHALT RAKER | | 06/01/2014 | \$30.60 | \$7.30 | \$12.10 | \$0.00 | \$50.00 |
| LABORERS - ZONE 2 | | 12/01/2014 | \$31.10 | \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| | | 06/01/2015 | \$31.60 | \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | | 12/01/2015 | \$32.10 | \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | | 06/01/2016 | \$32.60 | \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | | 12/01/2016 | \$33.35 | \$7.30 | \$12.10 | \$0.00 | \$52.75 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | | |
| Issue Date: 11/03/2014 | Wage Request Number: | 20141103- | 008 | | | | Page 2 of 39 |

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|---|----------------|-----------|---------|---------|------------------------------|------------|
| ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE OPERATING ENGINEERS LOCAL 4 | 06/01/2014 | \$41.49 | \$10.00 | \$14.20 | \$0.00 | \$65.69 |
| | 12/01/2014 | \$42.49 | \$10.00 | \$14.20 | \$0.00 | \$66.69 |
| | 06/01/2015 | \$43.24 | \$10.00 | \$14.20 | \$0.00 | \$67.44 |
| | 12/01/2015 | \$44.49 | \$10.00 | \$14.20 | \$0.00 | \$68.69 |
| | 06/01/2016 | \$45.24 | \$10.00 | \$14.20 | \$0.00 | \$69.44 |
| | 12/01/2016 | \$46.49 | \$10.00 | \$14.20 | \$0.00 | \$70.69 |
| | 06/01/2017 | \$47.49 | \$10.00 | \$14.20 | \$0.00 | \$71.69 |
| | 12/01/2017 | \$48.49 | \$10.00 | \$14.20 | \$0.00 | \$72.69 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | | | | | | |
| DEPATING ENGINEERS LOCAL 4 | 06/01/2014 | \$41.49 | \$10.00 | \$14.20 | \$0.00 | \$65.69 |
| | 12/01/2014 | \$42.49 | \$10.00 | \$14.20 | \$0.00 | \$66.69 |
| | 06/01/2015 | \$43.24 | \$10.00 | \$14.20 | \$0.00 | \$67.44 |
| | 12/01/2015 | \$44.49 | \$10.00 | \$14.20 | \$0.00 | \$68.69 |
| | 06/01/2016 | \$45.24 | \$10.00 | \$14.20 | \$0.00 | \$69.44 |
| | 12/01/2016 | \$46.49 | \$10.00 | \$14.20 | \$0.00 | \$70.69 |
| | 06/01/2017 | \$47.49 | \$10.00 | \$14.20 | \$0.00 | \$71.69 |
| | 12/01/2017 | \$48.49 | \$10.00 | \$14.20 | \$0.00 | \$72.69 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | | | | | | |
| BARCO-TYPE JUMPING TAMPER | 06/01/2014 | \$30.60 | \$7.30 | \$12.10 | \$0.00 | \$50.00 |
| PHOURIN - SOME S | 12/01/2014 | \$31.10 | \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| | 06/01/2015 | \$31.60 | \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | 12/01/2015 | \$32.10 | \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | 06/01/2016 | \$32.60 | \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | 12/01/2016 | \$33.35 | \$7.30 | \$12.10 | \$0.00 | \$52.75 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| BLOCK PAVER, RAMMER / CURB SETTER | 06/01/2014 | \$31.10 | \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| LABORERS - ZONE Z | 12/01/2014 | \$31.60 | \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | 06/01/2015 | \$32.10 | \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | 12/01/2015 | \$32.60 | \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | 06/01/2016 | \$33.10 | \$7.30 | \$12.10 | \$0.00 | \$52.50 |
| | 12/01/2016 | \$33.85 | \$7.30 | \$12.10 | \$0.00 | \$53.25 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| BOILER MAKER BOILERMAKERS LOCAL 29 | 01/01/2010 | \$37.70 | \$6.97 | \$11.18 | \$0.00 | \$55.85 |

| Classification | | | | Effective Da | te Base Wag | e Health | Pension | Supplemental Unemployment | Total Rate |
|-----------------------------|---------------------------|------------------------------------|-------------------------------------|----------------------|-------------|----------|-----------------------------|------------------------------|------------|
| | Apprei Effecti Step | ntice - BC ve Date - percent | DILERMAKER - Local 29 01/01/2010 | Apprentice Base Wage | Health | Pension | Supplementa Unemployment | 1 t Total Rate | |
| | 1 | 65 | | \$24.51 | \$6.97 | \$11.18 | \$0.00 | \$42.66 | |
| | 2 | 65 | | \$24.51 | \$6.97 | \$11.18 | \$0.00 | \$42.66 | |
| | 3 | 70 | | \$26.39 | \$6.97 | \$11.18 | \$0.00 | \$44.54 | |
| | 4 | 75 | | \$28.28 | \$6.97 | \$11.18 | \$0.00 | \$46.43 | |
| | 5 | 80 | | \$30.16 | \$6.97 | \$11.18 | \$0.00 | \$48.31 | |
| | 6 | 85 | | \$32.05 | \$6.97 | \$11.18 | \$0.00 | \$50.20 | |
| | 7 | 90 | | \$33.93 | \$6.97 | \$11.18 | \$0.00 | \$52.08 | |
| | 8 | 95 | | \$35.82 | \$6.97 | \$11.18 | \$0.00 | \$53.97 | |
| | Notes: | ntice to Jo | unewarker Patio 1:5 | | | | | | |
| BRICK/STONE | ARTIF | ICIAL MA | SONRY (INCL. MASONR | Y 00/01/201 | £ 46.94 | \$10.10 | \$17.62 | \$0.00 | \$74.66 |
| WATERPROO BRICKLAYERS LO | FING) CAL 3 (WC | ORCESTER) | | 03/01/2012 | \$40.80 | \$10.18 | \$17.62 | \$0.00 | \$75.22 |

09/01/2015

03/01/2016

09/01/2016

03/01/2017

\$48.32 \$10.18 \$17.69

\$48.89 \$10.18 \$17.69

\$49.79 \$10.18 \$17.77

\$50.36 \$10.18 \$17.77

\$0.00

\$0.00

\$0.00

\$0.00

\$76.19

\$76.76

\$77.74

\$78.31

| Apprentice - | BRICK/PLASTER/CEMENT MASON - Local 3 Worcester |
|----------------|--|
| Effective Date | - 09/01/2014 |

| Effect | ive Date - | 09/01/2014 | | | | Supplemental | | |
|--------|------------|------------|----------------------|---------|---------|--------------|------------|--|
| Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| 1 | 50 | | \$23.43 | \$10.18 | \$17.62 | \$0.00 | \$51.23 | |
| 2 | 60 | | \$28.12 | \$10.18 | \$17.62 | \$0.00 | \$55.92 | |
| 3 | 70 | | \$32.80 | \$10.18 | \$17.62 | \$0.00 | \$60.60 | |
| 4 | 80 | | \$37.49 | \$10.18 | \$17.62 | \$0.00 | \$65.29 | |
| 5 | 90 | | \$42.17 | \$10.18 | \$17.62 | \$0.00 | \$69.97 | |

| Effecti | ve Date - | 03/01/2015 | | | | Supplemental | |
|---------|-----------|------------|----------------------|---------|---------|--------------|------------|
| Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate |
| 1 | 50 | | \$23.71 | \$10.18 | \$17.62 | \$0.00 | \$51.51 |
| 2 | 60 | | \$28.45 | \$10.18 | \$17.62 | \$0.00 | \$56.25 |
| 3 | 70 | | \$33.19 | \$10.18 | \$17.62 | \$0.00 | \$60.99 |
| 4 | 80 | | \$37.94 | \$10.18 | \$17.62 | \$0.00 | \$65.74 |
| 5 | 90 | | \$42.68 | \$10.18 | \$17.62 | \$0.00 | \$70.48 |
| Notes: | | | | | | | |
| L | | | | | | | |

Apprentice to Journeyworker Ratio:1:5

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|------------|
| BULLDOZER/GRADER/SCRAPER | 06/01/2014 | \$41.10 | \$10.00 | \$14.20 | \$0.00 | \$65.30 |
| OFERALING ENGINEERS LOCAL 4 | 12/01/2014 | \$42.09 | \$10.00 | \$14.20 | \$0.00 | \$66.29 |
| | 06/01/2015 | \$42.83 | \$10.00 | \$14.20 | \$0.00 | \$67.03 |
| | 12/01/2015 | \$44.07 | \$10.00 | \$14.20 | \$0.00 | \$68.27 |
| | 06/01/2016 | \$44.82 | \$10.00 | \$14.20 | \$0.00 | \$69.02 |
| | 12/01/2016 | \$46.05 | \$10.00 | \$14.20 | \$0.00 | \$70.25 |
| | 06/01/2017 | \$47.04 | \$10.00 | \$14.20 | \$0.00 | \$71.24 |
| | 12/01/2017 | \$48.03 | \$10.00 | \$14.20 | \$0.00 | \$72.23 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | | | | | | |
| CAISSON & UNDERPINNING BOTTOM MAN | 06/01/2014 | \$35.20 | \$7.30 | \$12.90 | \$0.00 | \$55.40 |
| LABORERS - FOUNDATION AND MARINE | 12/01/2014 | \$35.95 | \$7.30 | \$12.90 | \$0.00 | \$56.15 |
| | 06/01/2015 | \$36.70 | \$7.30 | \$12.90 | \$0.00 | \$56.90 |
| | 12/01/2015 | \$37.45 | \$7.30 | \$12.90 | \$0.00 | \$57.65 |
| | 06/01/2016 | \$38.20 | \$7.30 | \$12.90 | \$0.00 | \$58.40 |
| For apprentice rates see "Apprentice- LABORER" | 12/01/2016 | \$39.20 | \$7.30 | \$12.90 | \$0.00 | \$59.40 |
| CAISSON & UNDERPINNING LABORER | 06/01/2014 | \$34.05 | \$7.30 | \$12.90 | \$0.00 | \$54.25 |
| LABORERS - FOUNDATION AND MARINE | 12/01/2014 | \$34.80 | \$7.30 | \$12.90 | \$0.00 | \$55.00 |
| | 06/01/2015 | \$35.55 | \$7.30 | \$12.90 | \$0.00 | \$55.75 |
| | 12/01/2015 | \$36.30 | \$7.30 | \$12.90 | \$0.00 | \$56.50 |
| | 06/01/2016 | \$37.05 | \$7.30 | \$12.90 | \$0.00 | \$57.25 |
| | 12/01/2016 | \$38.05 | \$7.30 | \$12.90 | \$0.00 | \$58.25 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| CAISSON & UNDERPINNING TOP MAN | 06/01/2014 | \$34.05 | \$7.30 | \$12.90 | \$0.00 | \$54.25 |
| LABORERS - FOUNDATION AND MARINE | 12/01/2014 | \$34.80 | \$7.30 | \$12.90 | \$0.00 | \$55.00 |
| | 06/01/2015 | \$35.55 | \$7.30 | \$12.90 | \$0.00 | \$55.75 |
| | 12/01/2015 | \$36.30 | \$7.30 | \$12.90 | \$0.00 | \$56.50 |
| | 06/01/2016 | \$37.05 | \$7.30 | \$12.90 | \$0.00 | \$57.25 |
| | 12/01/2016 | \$38.05 | \$7.30 | \$12.90 | \$0.00 | \$58.25 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| CARBIDE CORE DRILL OPERATOR | 06/01/2014 | \$30.60 | \$7.30 | \$12.10 | \$0.00 | \$50.00 |
| THOURD - LOINE Z | 12/01/2014 | \$31.10 | \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| | 06/01/2015 | \$31.60 | \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | 12/01/2015 | \$32.10 | \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | 06/01/2016 | \$32.60 | \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| For apprentice rates see "Apprentice- LABORER" | 12/01/2016 | \$33.35 | \$7.30 | \$12.10 | \$0.00 | \$52.75 |
| CARPENTER | 09/01/2014 | \$35.35 | \$9.80 | \$16.11 | \$0.00 | \$61.26 |
| CARPENTERS -ZONE 2 (Eastern Massachusetts) | 03/01/2015 | \$36.12 | \$9.80 | \$16.11 | \$0.00 | \$62.03 |

 Issue Date:
 11/03/2014
 Wage Request Number:
 20141103-008
 Page 5 of 39

Supplemental

Total Rate

| Classification | | | | Effective Da | te Base Wag | e Health | rension | Inemployment | Total Kale |
|----------------|-----------|--------------|--------------------------|----------------------|-------------|----------|--------------|--------------|------------|
| | | | | | | | | | |
| | Appre | ntice - CA | ARPENTER - Zone 2 Easter | n MA | | | | | |
| | Effecti | ive Date - | 09/01/2014 | | | | Supplemental | | |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| | 1 | 50 | | \$17.68 | \$9.80 | \$1.57 | \$0.00 | \$29.05 | |
| | 2 | 60 | | \$21.21 | \$9.80 | \$1.57 | \$0.00 | \$32.58 | |
| | 3 | 70 | | \$24.75 | \$9.80 | \$11.40 | \$0.00 | \$45.95 | |
| | 4 | 75 | | \$26.51 | \$9.80 | \$11.40 | \$0.00 | \$47.71 | |
| | 5 | 80 | | \$28.28 | \$9.80 | \$12.97 | \$0.00 | \$51.05 | |
| | 6 | 80 | | \$28.28 | \$9.80 | \$12.97 | \$0.00 | \$51.05 | |
| | 7 | 90 | | \$31.82 | \$9.80 | \$14.54 | \$0.00 | \$56.16 | |
| | 8 | 90 | | \$31.82 | \$9.80 | \$14.54 | \$0.00 | \$56.16 | |
| | Effecti | ve Date - | 03/01/2015 | | | | Supplemental | | |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| | 1 | 50 | | \$18.06 | \$9.80 | \$1.57 | \$0.00 | \$29.43 | |
| | 2 | 60 | | \$21.67 | \$9.80 | \$1.57 | \$0.00 | \$33.04 | |
| | 3 | 70 | | \$25.28 | \$9.80 | \$11.40 | \$0.00 | \$46.48 | |
| | 4 | 75 | | \$27.09 | \$9.80 | \$11.40 | \$0.00 | \$48.29 | |
| | 5 | 80 | | \$28.90 | \$9.80 | \$12.97 | \$0.00 | \$51.67 | |
| | 6 | 80 | | \$28.90 | \$9.80 | \$12.97 | \$0.00 | \$51.67 | |
| | 7 | 90 | | \$32.51 | \$9.80 | \$14.54 | \$0.00 | \$56.85 | |
| | 8 | 90 | | \$32.51 | \$9.80 | \$14.54 | \$0.00 | \$56.85 | |
| | Notes: | | | | | | | | |
| | Appre | ntice to Joi | urneyworker Ratio:1:5 | | | | | | |
| CEMENT MAS | SONRY | PLASTER | ING | 07/01/2014 | \$42.70 | \$10.90 | \$18.71 | \$1.30 | \$73.61 |
| BRICKLAYERS LO | CAL 3 (WO | ORCESTER) | | 01/01/2015 | \$43.29 | \$10.90 | \$18.71 | \$1.30 | \$74.20 |
| | | | | 07/01/2015 | \$44.23 | \$10.90 | \$18.71 | \$1.30 | \$75.14 |
| | | | | 01/01/2016 | \$44.82 | \$10.90 | \$18.71 | \$1.30 | \$75.73 |

Effective Date Base Wage Health Pension

Classification

Issue Date: 11/03/2014

| Classification | | | | Effective Da | te Base W | Vage Health | Pension | Supplemental Unemployment | Total Rate |
|-----------------|--------------------|----------------------|--------------------------------|----------------------|-------------------|-------------|------------------------------|------------------------------|------------|
| | Appren | ntice - CE | MENT MASONRY/PLASTER | RING - Worcester | | | | | |
| | Effectiv Step | ve Date - percent | 07/01/2014 | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate | • |
| | 1 | 50 | | \$21.35 | \$10.90 | \$12.21 | \$1.30 | \$45.76 | |
| | 2 | 60 | | \$25.62 | \$10.90 | \$13.71 | \$1.30 | \$51.53 | |
| | 3 | 65 | | \$27.76 | \$10.90 | \$14.71 | \$1.30 | \$54.67 | |
| | 4 | 70 | | \$29.89 | \$10.90 | \$15.71 | \$1.30 | \$57.80 | |
| | 5 | 75 | | \$32.03 | \$10.90 | \$16.71 | \$1.30 | \$60.94 | ļ |
| | 6 | 80 | | \$34.16 | \$10.90 | \$17.71 | \$1.30 | \$64.07 | |
| | 7 | 90 | | \$38.43 | \$10.90 | \$18.71 | \$1.30 | \$69.34 | Ļ |
| | Effectiv | ve Date - | 01/01/2015 | | | | Supplemental | | |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | ; |
| | 1 | 50 | | \$21.65 | \$10.90 | \$12.21 | \$1.30 | \$46.06 | |
| | 2 | 60 | | \$25.97 | \$10.90 | \$13.71 | \$1.30 | \$51.88 | |
| | 3 | 65 | | \$28.14 | \$10.90 | \$14.71 | \$1.30 | \$55.05 | |
| | 4 | 70 | | \$30.30 | \$10.90 | \$15.71 | \$1.30 | \$58.21 | |
| | 5 | 75 | | \$32.47 | \$10.90 | \$16.71 | \$1.30 | \$61.38 | |
| | 0 | 80 | | \$34.63 | \$10.90 | \$17.71 | \$1.30 | \$64.54 | |
| | 1 | 90 | | \$38.96 | \$10.90 | \$18.71 | \$1.30 | \$69.87 | |
| | Notes: | Steps 3,4 a | re 500 hrs. All other steps ar | e 1,000 hrs. | | | | | |
| | Apprei | ntice to Jou | rneyworker Ratio:1:3 | | | | | | |
| CHAIN SAW O | PERAT | OR | | 06/01/2014 | 4 \$30. | 60 \$7.30 | \$12.10 | \$0.00 | \$50.00 |
| LABORERS - ZONE | 2 | | | 12/01/2014 | 4 \$31. | 10 \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| | | | | 06/01/2015 | 5 \$31. | 60 \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | | | | 12/01/2015 | 5 \$32. | 10 \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | | | | 06/01/2010 | 5 \$32. | 60 \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | | | | 12/01/2010 | \$33. | 35 \$7.30 | \$12.10 | \$0.00 | \$52.75 |
| For apprentice | rates see " | Apprentice- L. | ABORER" | | | | N N SIDY | | |
| OPERATING ENGL | S/SLUK NEERS LC | RY BUCK CAL 4 | ETS/HEADING MACHINES | 6 06/01/2014 | 4 \$42. | 49 \$10.00 | \$14.20 | \$0.00 | \$66.69 |
| | | | | 12/01/2014 | 4 \$43. | 49 \$10.00 | \$14.20 | \$0.00 | \$67.69 |
| | | | | 06/01/2013 | \$ \$44. | 24 \$10.00 | \$14.20 | \$0.00 | \$68.44 |
| | | | | 12/01/2013 | \$45. | 49 \$10.00 | \$14.20 | \$0.00 | \$69.69 |
| | | | | 06/01/2010 | 5 \$46. | 4 \$10.00 | \$14.20 | \$0.00 | \$70.44 |
| | | | | 12/01/2010 | 5 547. 7 \$49 | 49 \$10.00 | \$14.20 | \$0.00 | \$72.60 |
| | | | | 12/01/201 | / \$48. 7 \$40 | 49 \$10.00 | \$14.20 | \$0.00 | \$72.09 |
| For apprentice | rates see ". | Apprentice- O | PERATING ENGINEERS" | 12/01/201 | \$49. | 49 \$10.00 | \$14.20 | φ0.00 | \$/3.09 |
| | | | | | | | | | |

Page 7 of 39

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|------------|
| COMPRESSOR OPERATOR | 06/01/2014 | \$28.80 | \$10.00 | \$14.20 | \$0.00 | \$53.00 |
| OPERATING ENGINEERS LOCAL 4 | 12/01/2014 | \$29.50 | \$10.00 | \$14.20 | \$0.00 | \$53.70 |
| | 06/01/2015 | \$30.02 | \$10.00 | \$14.20 | \$0.00 | \$54.22 |
| | 12/01/2015 | \$30.89 | \$10.00 | \$14.20 | \$0.00 | \$55.09 |
| | 06/01/2016 | \$31.41 | \$10.00 | \$14.20 | \$0.00 | \$55.61 |
| | 12/01/2016 | \$32.28 | \$10.00 | \$14.20 | \$0.00 | \$56.48 |
| | 06/01/2017 | \$32.97 | \$10.00 | \$14.20 | \$0.00 | \$57.17 |
| | 12/01/2017 | \$33.66 | \$10.00 | \$14.20 | \$0.00 | \$57.86 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | | | | | | |
| DELEADER (BRIDGE) | 07/01/2014 | \$46.76 | \$7.85 | \$16.10 | \$0.00 | \$70.71 |
| FAINI BRS DALAL 55 - ZOINE Z | 01/01/2015 | \$47.66 | \$7.85 | \$16.10 | \$0.00 | \$71.61 |
| | 07/01/2015 | \$48.56 | \$7.85 | \$16.10 | \$0.00 | \$72.51 |
| | 01/01/2016 | \$49.51 | \$7.85 | \$16.10 | \$0.00 | \$73.46 |
| | 07/01/2016 | \$50.46 | \$7.85 | \$16.10 | \$0.00 | \$74.41 |
| | 01/01/2017 | \$51.41 | \$7.85 | \$16.10 | \$0.00 | \$75.36 |

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

| Effect | ive Date - 07/01/2014 | | | | Supplemental | | |
|--------|-----------------------|----------------------|--------|---------|--------------|------------|--|
| Step | percent | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| 1 | 50 | \$23.38 | \$7.85 | \$0.00 | \$0.00 | \$31.23 | |
| 2 | 55 | \$25.72 | \$7.85 | \$3.66 | \$0.00 | \$37.23 | |
| 3 | 60 | \$28.06 | \$7.85 | \$3.99 | \$0.00 | \$39.90 | |
| 4 | 65 | \$30.39 | \$7.85 | \$4.32 | \$0.00 | \$42.56 | |
| 5 | 70 | \$32.73 | \$7.85 | \$14.11 | \$0.00 | \$54.69 | |
| 6 | 75 | \$35.07 | \$7.85 | \$14.44 | \$0.00 | \$57.36 | |
| 7 | 80 | \$37.41 | \$7.85 | \$14.77 | \$0.00 | \$60.03 | |
| 8 | 90 | \$42.08 | \$7.85 | \$15.44 | \$0.00 | \$65.37 | |

| Effect | ive Date - 01/01/2015 | | | | Supplemental | |
|--------|-----------------------|----------------------|--------|---------|--------------|------------|
| Step | percent | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate |
| 1 | 50 | \$23.83 | \$7.85 | \$0.00 | \$0.00 | \$31.68 |
| 2 | 55 | \$26.21 | \$7.85 | \$3.66 | \$0.00 | \$37.72 |
| 3 | 60 | \$28.60 | \$7.85 | \$3.99 | \$0.00 | \$40.44 |
| 4 | 65 | \$30.98 | \$7.85 | \$4.32 | \$0.00 | \$43.15 |
| 5 | 70 | \$33.36 | \$7.85 | \$14.11 | \$0.00 | \$55.32 |
| 6 | 75 | \$35.75 | \$7.85 | \$14.44 | \$0.00 | \$58.04 |
| 7 | 80 | \$38.13 | \$7.85 | \$14.77 | \$0.00 | \$60.75 |
| 8 | 90 | \$42.89 | \$7.85 | \$15.44 | \$0.00 | \$66.18 |
| Notes: | | | | | | |
| | Steps are 750 hrs. | | | | | |

Apprentice to Journeyworker Ratio:1:1

 Issue Date:
 11/03/2014
 Wage Request Number:
 20141103-008

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|--------------|
| DEMO: ADZEMAN | 06/01/2014 | \$34.25 | \$7.30 | \$12.70 | \$0.00 | \$54.25 |
| LABORERS - ZONE 2 | 12/01/2014 | \$35.00 | \$7.30 | \$12.70 | \$0.00 | \$55.00 |
| | 06/01/2015 | \$35.75 | \$7.30 | \$12.70 | \$0.00 | \$55.75 |
| | 12/01/2015 | \$36.50 | \$7.30 | \$12.70 | \$0.00 | \$56.50 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| LABORERS - ZONE 2 | 06/01/2014 | \$35.25 | \$7.30 | \$12.70 | \$0.00 | \$55.25 |
| | 12/01/2014 | \$36.00 | \$7.30 | \$12.70 | \$0.00 | \$56.00 |
| | 06/01/2015 | \$36.75 | \$7.30 | \$12.70 | \$0.00 | \$56.75 |
| For apprentice rates see "Apprentice- LABORER" | 12/01/2015 | \$37.50 | \$7.30 | \$12.70 | \$0.00 | \$57.50 |
| DEMO: BURNERS | 06/01/2014 | \$35.00 | \$7.30 | \$12.70 | \$0.00 | \$55.00 |
| LABORERS - ZONE 2 | 12/01/2014 | \$35.75 | \$7.30 | \$12.70 | \$0.00 | \$55.75 |
| | 06/01/2015 | \$36.50 | \$7.30 | \$12.70 | \$0.00 | \$56.50 |
| | 12/01/2015 | \$37.25 | \$7.30 | \$12.70 | \$0.00 | \$57.25 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| DEMO: CONCRETE CUTTER/SAWYER | 06/01/2014 | \$35.25 | \$7.30 | \$12.70 | \$0.00 | \$55.25 |
| LABORERS - ZONE Z | 12/01/2014 | \$36.00 | \$7.30 | \$12.70 | \$0.00 | \$56.00 |
| | 06/01/2015 | \$36.75 | \$7.30 | \$12.70 | \$0.00 | \$56.75 |
| | 12/01/2015 | \$37.50 | \$7.30 | \$12.70 | \$0.00 | \$57.50 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| LABORERS - ZONE 2 | 06/01/2014 | \$35.00 | \$7.30 | \$12.70 | \$0.00 | \$55.00 |
| | 12/01/2014 | \$35.75 | \$7.30 | \$12.70 | \$0.00 | \$55.75 |
| | 06/01/2015 | \$36.50 | \$7.30 | \$12.70 | \$0.00 | \$56.50 |
| For apprentice rates see "Apprentice- LABORER" | 12/01/2015 | \$37.25 | \$7.30 | \$12.70 | \$0.00 | \$57.25 |
| DEMO: WRECKING LABORER | 06/01/2014 | \$24.25 | \$7.20 | \$12.70 | \$0.00 | \$54.25 |
| LABORERS - ZONE 2 | 12/01/2014 | \$34.23 | \$7.30 | \$12.70 | \$0.00 | \$55.00 |
| | 06/01/2014 | \$35.00 | \$7.50 | \$12.70 | \$0.00 | \$55.00 |
| | 12/01/2015 | \$35.75 | \$7.30 | \$12.70 | \$0.00 | \$55.75 |
| For apprentice rates see "Apprentice- LABORER" | 12/01/2015 | \$30.30 | \$7.50 | \$12.70 | \$0.00 | \$30.30 |
| DIRECTIONAL DRILL MACHINE OPERATOR | 06/01/2014 | \$41.10 | \$10.00 | \$14.20 | \$0.00 | \$65.30 |
| OPERATING ENGINEERS LOCAL 4 | 12/01/2014 | \$42.09 | \$10.00 | \$14.20 | \$0.00 | \$66.29 |
| | 06/01/2015 | \$42.83 | \$10.00 | \$14.20 | \$0.00 | \$67.03 |
| | 12/01/2015 | \$44.07 | \$10.00 | \$14.20 | \$0.00 | \$68.27 |
| | 06/01/2016 | \$44.82 | \$10.00 | \$14.20 | \$0.00 | \$69.02 |
| | 12/01/2016 | \$46.05 | \$10.00 | \$14.20 | \$0.00 | \$70.25 |
| | 06/01/2017 | \$47.04 | \$10.00 | \$14.20 | \$0.00 | \$71.24 |
| | 12/01/2017 | \$48.03 | \$10.00 | \$14.20 | \$0.00 | \$72.23 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | | | | | | |
| DIVER | 08/01/2014 | \$58.24 | \$9.80 | \$18.17 | \$0.00 | \$86.21 |
| FILE DRIVER LOCAL 56 (20NE 2) | 08/01/2015 | \$60.34 | \$9.80 | \$18.17 | \$0.00 | \$88.31 |
| DIVER TENDER | 08/01/2014 | \$41.60 | \$9.80 | \$18.17 | \$0.00 | \$69.57 |
| FILE DRIVER DOGED DO (2014E 2) | 08/01/2015 | \$43.10 | \$9.80 | \$18.17 | \$0.00 | \$71.07 |
| DIVER TENDER (EFFLUENT) | 08/01/2014 | \$62.40 | \$9.80 | \$18.17 | \$0.00 | \$90.37 |
| PILE DRIVER LOCAL 36 (ZONE 2) | 08/01/2015 | \$64.65 | \$9.80 | \$18.17 | \$0.00 | \$92.62 |
| DIVER/SLURRY (EFFLUENT) | 08/01/2014 | \$87.36 | \$9.80 | \$18.17 | \$0.00 | \$115.33 |
| FILE DRIVER LOCAL 36 (ZONE 2) | 08/01/2015 | \$90.51 | \$9.80 | \$18.17 | \$0.00 | \$118.48 |
| Issue Date: 11/03/2014 Wage Request Num | ber: 20141103- | 008 | | | | Page 9 of 39 |

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|-----------------------|----------------|-----------|--------|---------|------------------------------|------------|
| ELECTRICIAN | 06/01/2014 | \$38.12 | \$7.91 | \$12.86 | \$0.00 | \$58.89 |
| ELECTRICIANS LOCAL 96 | 12/01/2014 | \$38.37 | \$8.16 | \$13.12 | \$0.00 | \$59.65 |
| | 06/01/2015 | \$38.87 | \$8.16 | \$13.62 | \$0.00 | \$60.65 |
| | 12/01/2015 | \$39.37 | \$8.41 | \$13.68 | \$0.00 | \$61.46 |

| step | percent | 00/01/2014 | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|---|---|------------|--|--|---|--|---|
| 1 | 40 | | \$15.25 | \$7.91 | \$0.46 | \$0.00 | \$23.62 |
| 2 | 43 | | \$16.39 | \$7.91 | \$0.49 | \$0.00 | \$24.79 |
| 3 | 48 | | \$18.30 | \$7.91 | \$10.09 | \$0.00 | \$36.30 |
| 4 | 55 | | \$20.97 | \$7.91 | \$10.47 | \$0.00 | \$39.35 |
| 5 | 65 | | \$24.78 | \$7.91 | \$11.00 | \$0.00 | \$43.69 |
| 1.01 | | | 000.00 | \$7.01 | ¢11.01 | \$0.00 | \$50.22 |
| 6 Effecti Step | 80 ive Date - percent | 12/01/2014 | \$30.50 Apprentice Base Wage | \$7.91 Health | Pension | Supplemental Unemployment | Total Rate |
| 6 Effecti Step | 80 ive Date - percent | 12/01/2014 | \$30.50 Apprentice Base Wage | \$7.91 Health | Pension | Supplemental Unemployment | Total Rate |
| 6 Effecti Step 1 | 80 ive Date - percent 40 | 12/01/2014 | \$30.50 Apprentice Base Wage \$15.35 | \$7.91 Health \$8.16 | \$11.81 Pension \$0.46 | Supplemental Unemployment \$0.00 | Total Rate |
| 6 Effecti Step 1 2 | 80 ive Date - percent 40 43 | 12/01/2014 | \$30.50 Apprentice Base Wage \$15.35 \$16.50 | \$7.91 Health \$8.16 \$8.16 | \$11.81 Pension \$0.46 \$0.50 | Supplemental Unemployment \$0.00 \$0.00 | Total Rate \$23.97 \$25.16 |
| 6 Effecti Step 1 2 3 | 80 ive Date - percent 40 43 48 | 12/01/2014 | \$30.30 Apprentice Base Wage \$15.35 \$16.50 \$18.42 | \$7.91 Health \$8.16 \$8.16 \$8.16 | \$11.81 Pension \$0.46 \$0.50 \$10.33 | Supplemental Unemployment \$0.00 \$0.00 \$0.00 | Total Rate \$23.97 \$25.16 \$36.91 |
| 6 Effecti Step 1 2 3 4 | 80 ive Date - percent 40 43 48 55 | 12/01/2014 | \$30.50 Apprentice Base Wage \$15.35 \$16.50 \$18.42 \$21.10 | Health \$8.16 \$8.16 \$8.16 \$8.16 \$8.16 | \$11.81 Pension \$0.46 \$0.50 \$10.33 \$10.70 | Supplemental Unemployment \$0.00 \$0.00 \$0.00 \$0.00 | Total Rate \$23.97 \$25.16 \$36.91 \$39.96 |
| 6 Effecti Step 1 2 3 4 5 | 80 ive Date - percent 40 43 48 55 65 | 12/01/2014 | \$30.30 Apprentice Base Wage \$15.35 \$16.50 \$18.42 \$21.10 \$24.94 | Health \$8.16 \$8.16 \$8.16 \$8.16 \$8.16 \$8.16 | \$11.81 Pension \$0.46 \$0.50 \$10.33 \$10.70 \$11.24 | Supplemental Unemployment \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 | Total Rate \$23.97 \$25.16 \$36.91 \$39.96 \$44.34 |

| <u> </u> | | |
|------------|------------------|--------------|
| Apprentice | to Journeyworker | Ratio:2:3*** |

| ELEVATOR CONSTRUCTOR | 01/01/2014 | \$46.92 | \$12.73 | \$13.46 | \$0.00 | \$73.11 |
|--------------------------------|------------|---------|---------|---------|--------|---------|
| elevator constructors local 41 | 01/01/2015 | \$47.73 | \$13.58 | \$14.21 | \$0.00 | \$75.52 |
| | 01/01/2016 | \$48.77 | \$14.43 | \$14.96 | \$0.00 | \$78.16 |
| | 01/01/2017 | \$49.90 | \$15.28 | \$15.71 | \$0.00 | \$80.89 |
| | | | | | | |

| Classification | | | | | | Effective Da | te Ba | ise Wage | e Health | Pension | Supplemental Unemployment | Total Rate |
|------------------|-------------|-------------------|----------------|------------------|------------|--------------|------------|----------|----------|------------------------|------------------------------|----------------|
| | | FI FI | FVATOR CO | NSTRICTOR | - Logal 41 | | | | | | | |
| | Appren | ve Date - | 01/01/2014 | NSIKUCIOK | - 1.004 41 | | | | | | | |
| | Step | percent | | | Apprentice | Base Wage | Healt | h | Pension | Supplementa | Total Rate | • |
| | 1 | 50 | | | S | 23.46 | \$12.73 | 3 | \$13.46 | \$0.00 | \$49.65 | ; |
| | 2 | 55 | | | \$ | 25.81 | \$12.73 | 3 | \$13.46 | \$0.00 | \$52.00 |) |
| | 3 | 65 | | | s | 30.50 | \$12.73 | 3 | \$13.46 | \$0.00 | \$56.69 |) |
| | 4 | 70 | | | S | 32.84 | \$12.73 | 3 | \$13.46 | \$0.00 | \$59.03 | 3 |
| | 5 | 80 | | | \$ | 37.54 | \$12.73 | 3 | \$13.46 | \$0.00 | \$63.73 | 3 |
| | Effectiv | ve Date - | 01/01/2015 | | | | | | | Supplementa | 1 | |
| | Step | percent | | | Apprentice | Base Wage | Healt | h | Pension | Unemployment | t Total Rate | • |
| | 1 | 50 | | | \$ | 23.87 | \$13.58 | 8 | \$14.21 | \$0.00 | \$51.66 | i. |
| | 2 | 55 | | | \$ | 26.25 | \$13.58 | 8 | \$14.21 | \$0.00 | \$54.04 | 1 |
| | 3 | 65 | | | \$ | 31.02 | \$13.58 | 8 | \$14.21 | \$0.00 | \$58.81 | |
| | 4 | 70 | | | \$ | 33.41 | \$13.58 | 8 | \$14.21 | \$0.00 | \$61.20 |) |
| | 5 | 80 | | | S | 38.18 | \$13.5 | 8 | \$14.21 | \$0.00 | \$65.97 | 7 |
| | Notes: | | | | | | | | | | | |
| | | Steps 1-2 | are 6 mos.; St | teps 3-5 are 1 y | ear | | | | | | | |
| | Apprei | tice to Joi | rneyworker | Ratio:1:1 | | | | | | | | |
| ELEVATOR CO | ONSTRU | JCTOR HI | ELPER | | | 01/01/2014 | 1 3 | \$32.84 | \$12.73 | \$13.46 | \$0.00 | \$59.03 |
| ELEVATOR CONST. | RUCTOR | SLOCAL 41 | | | | 01/01/2015 | 5 9 | \$33.41 | \$13.58 | \$14.21 | \$0.00 | \$61.20 |
| | | | | | | 01/01/2016 | 5 5 | \$34.14 | \$14.43 | \$14.96 | \$0.00 | \$63.53 |
| | | | | | | 01/01/2013 | 7 | \$34.03 | \$15.28 | \$15.71 | \$0.00 | \$65.92 |
| For apprentice r | ates see ". | Apprentice - I | LEVATOR CON | NSTRUCTOR" | | 01/01/2017 | с х | ¢.94.95 | φ15.20 | Q1 017 1 | <i>40.00</i> | φ0 <i>5.72</i> |
| FENCE & GUA | RD RA | IL ERECT | OR | | | 06/01/2014 | 4 5 | \$30.60 | \$7.30 | \$12.10 | \$0.00 | \$50.00 |
| LABORERS - ZONE | 2 | | | | | 12/01/2014 | 1 5 | \$31.10 | \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| | | | | | | 06/01/2015 | 5 5 | \$31.60 | \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | | | | | | 12/01/2015 | 5 5 | \$32.10 | \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | | | | | | 06/01/2016 | 5 5 | \$32.60 | \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | | | | | | 12/01/2016 | 5 5 | \$33.35 | \$7.30 | \$12.10 | \$0.00 | \$52.75 |
| For apprentice r | ates see ". | Apprentice- L | ABORER" | | | | | | | | | |
| FIELD ENG.INS | ST.PER | SON-BLD ICAL 4 | G,SITE,HVY | /HWY | | 05/01/2014 | 4 | \$38.87 | \$10.00 | \$14.18 | \$0.00 | \$63.05 |
| For apprentice r | ates see ". | Apprentice- O | PERATING EN | GINEERS" | | | | | | | | |
| FIELD ENG.PA | RTY CI | HIEF-BLD CAL 4 | G,SITE,HVY | /HWY | | 05/01/2014 | 4 | \$40.29 | \$10.00 | \$14.18 | \$0.00 | \$64.47 |
| For apprentice r | ates see " | Apprentice- O | PERATING ENG | GINEERS" | | | | | | | | |
| FIELD ENG.RC | D PERS | SON-BLD CAL 4 | G,SITE,HVY | /HWY | | 05/01/2014 | 4 : | \$20.92 | \$10.00 | \$14.18 | \$0.00 | \$45.10 |
| For apprentice r | ates see " | Apprentice- O | PERATING EN | GINEERS" | | | | | | | | |
| FIRE ALARM I | NSTAL | LER | | | | 06/01/2014 | 1 3 | \$38.12 | \$7.91 | \$12.86 | \$0.00 | \$58.89 |
| ELECTRICIANS LO | CAL 96 | | | | | 12/01/2014 | 4 5 | \$38.37 | \$8.16 | \$13.12 | \$0.00 | \$59.65 |
| | | | | | | 06/01/2015 | 5 5 | \$38.87 | \$8.16 | \$13.62 | \$0.00 | \$60.65 |
| | | | | | | 12/01/2015 | 5 5 | \$39.37 | \$8.41 | \$13.68 | \$0.00 | \$61.46 |
| For apprentice r | ates see ". | Apprentice- E | LECTRICIAN" | | | | | | | | | |
| Issue Date: 11 | /03/201 | 4 | | Wage Reque | st Number: | 2014110 | 03-008 | | | |] | Page 11 of 39 |

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|------------|
| FIRE ALARM REPAIR / MAINT/COMMISSIONING | 06/01/2014 | \$38.12 | \$7.91 | \$12.86 | \$0.00 | \$58.89 |
| ELECTRICIANS LOCAL 96 | 12/01/2014 | \$38.37 | \$8.16 | \$13.12 | \$0.00 | \$59.65 |
| | 06/01/2015 | \$38.87 | \$8.16 | \$13.62 | \$0.00 | \$60.65 |
| | 12/01/2015 | \$39.37 | \$8.41 | \$13.68 | \$0.00 | \$61.46 |
| For apprentice rates see "Apprentice- ELECTRICIAN" | | | | | | |
| FIREMAN (ASST. ENGINEER) | 06/01/2014 | \$34.59 | \$10.00 | \$14.20 | \$0.00 | \$58.79 |
| OPERATING ENGINEERS LOCAL 4 | 12/01/2014 | \$35.43 | \$10.00 | \$14.20 | \$0.00 | \$59.63 |
| | 06/01/2015 | \$36.05 | \$10.00 | \$14.20 | \$0.00 | \$60.25 |
| | 12/01/2015 | \$37.10 | \$10.00 | \$14.20 | \$0.00 | \$61.30 |
| | 06/01/2016 | \$37.72 | \$10.00 | \$14.20 | \$0.00 | \$61.92 |
| | 12/01/2016 | \$38.76 | \$10.00 | \$14.20 | \$0.00 | \$62.96 |
| | 06/01/2017 | \$39.60 | \$10.00 | \$14.20 | \$0.00 | \$63.80 |
| | 12/01/2017 | \$40.43 | \$10.00 | \$14.20 | \$0.00 | \$64.63 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | | | | | | |
| FLAGGER & SIGNALER | 06/01/2014 | \$20.50 | \$7.30 | \$12.10 | \$0.00 | \$39.90 |
| LABORERS - ZONE 2 | 12/01/2014 | \$20.50 | \$7.30 | \$12.10 | \$0.00 | \$39.90 |
| | 06/01/2015 | \$20.50 | \$7.30 | \$12.10 | \$0.00 | \$39.90 |
| | 12/01/2015 | \$20.50 | \$7.30 | \$12.10 | \$0.00 | \$39.90 |
| | 06/01/2016 | \$20.50 | \$7.30 | \$12.10 | \$0.00 | \$39.90 |
| | 12/01/2016 | \$20.50 | \$7.30 | \$12.10 | \$0.00 | \$39.90 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| FLOORCOVERER FLOORCOVERERS LOCAL 2168 ZONE II | 09/01/2014 | \$38.09 | \$9.80 | \$17.21 | \$0.00 | \$65.10 |

Apprentice - FLOORCOVERER - Local 2168 Zone II Effective Date - 09/01/2014

| Effecti | ve Date - 09/01/2014 | | | | Supplemental | | |
|---------|----------------------|----------------------|--------|---------|--------------|------------|--|
| Step | percent | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| 1 | 50 | \$19.05 | \$9.80 | \$1.79 | \$0.00 | \$30.64 | |
| 2 | 55 | \$20.95 | \$9.80 | \$1.79 | \$0.00 | \$32.54 | |
| 3 | 60 | \$22.85 | \$9.80 | \$11.84 | \$0.00 | \$44.49 | |
| 4 | 65 | \$24.76 | \$9.80 | \$11.84 | \$0.00 | \$46.40 | |
| 5 | 70 | \$26.66 | \$9.80 | \$13.63 | \$0.00 | \$50.09 | |
| 6 | 75 | \$28.57 | \$9.80 | \$13.63 | \$0.00 | \$52.00 | |
| 7 | 80 | \$30.47 | \$9.80 | \$15.42 | \$0.00 | \$55.69 | |
| 8 | 85 | \$32.38 | \$9.80 | \$15.42 | \$0.00 | \$57.60 | |
| Notes: | | | | | | | |
| | Steps are 750 hrs. | | | | | | |

Apprentice to Journeyworker Ratio:1:1

 Issue Date:
 11/03/2014
 Wage Request Number:
 20141103-008
 Page 12 of 30

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|------------|
| FORK LIFT/CHERRY PICKER | 06/01/2014 | \$41.49 | \$10.00 | \$14.20 | \$0.00 | \$65.69 |
| OPERATING ENGINEERS LOCAL 4 | 12/01/2014 | \$42.49 | \$10.00 | \$14.20 | \$0.00 | \$66.69 |
| | 06/01/2015 | \$43.24 | \$10.00 | \$14.20 | \$0.00 | \$67.44 |
| | 12/01/2015 | \$44.49 | \$10.00 | \$14.20 | \$0.00 | \$68.69 |
| | 06/01/2016 | \$45.24 | \$10.00 | \$14.20 | \$0.00 | \$69.44 |
| | 12/01/2016 | \$46.49 | \$10.00 | \$14.20 | \$0.00 | \$70.69 |
| | 06/01/2017 | \$47.49 | \$10.00 | \$14.20 | \$0.00 | \$71.69 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | 12/01/2017 | \$48.49 | \$10.00 | \$14.20 | \$0.00 | \$72.69 |
| GENERATOR/LIGHTING PLANT/HEATERS | 06/01/2014 | \$28.80 | \$10.00 | \$14.20 | \$0.00 | \$53.00 |
| OPERATING ENGINEERS LOCAL 4 | 12/01/2014 | \$29.50 | \$10.00 | \$14.20 | \$0.00 | \$53.70 |
| | 06/01/2015 | \$30.02 | \$10.00 | \$14.20 | \$0.00 | \$54.22 |
| | 12/01/2015 | \$30.89 | \$10.00 | \$14.20 | \$0.00 | \$55.09 |
| | 06/01/2016 | \$31.41 | \$10.00 | \$14.20 | \$0.00 | \$55.61 |
| | 12/01/2016 | \$32.28 | \$10.00 | \$14.20 | \$0.00 | \$56.48 |
| | 06/01/2017 | \$32.97 | \$10.00 | \$14.20 | \$0.00 | \$57.17 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | 12/01/2017 | \$33.66 | \$10.00 | \$14.20 | \$0.00 | \$57.86 |
| GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR | 07/01/2014 | \$36.26 | \$7.85 | \$16.10 | \$0.00 | \$60.21 |
| SYSTEMS) | 01/01/2015 | \$37.16 | \$7.85 | \$16.10 | \$0.00 | \$61.11 |
| OLAZIENS LOCAL 35 (ZONE 2) | 07/01/2015 | \$38.06 | \$7.85 | \$16.10 | \$0.00 | \$62.01 |
| | 01/01/2016 | \$39.01 | \$7.85 | \$16.10 | \$0.00 | \$62.96 |
| | 07/01/2016 | \$39.96 | \$7.85 | \$16.10 | \$0.00 | \$63.91 |
| | 01/01/2017 | \$40.91 | \$7.85 | \$16.10 | \$0.00 | \$64.86 |

| Classification | | | | Effective Da | te Base Wag | e Health | Pension | Supplemental Unemployment | Total Rate |
|----------------|----------------------------------|--------------|-------------------------|----------------------|-------------|----------|------------------------------|------------------------------|------------|
| | | | | | | | | | |
| | Apprei | tice - GL | AZIER - Local 35 Zone 2 | | | | | | |
| | Effecti | ve Date - | 07/01/2014 | | | | Supplemental | | |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| | 1 | 50 | | \$18.13 | \$7.85 | \$0.00 | \$0.00 | \$25.98 | |
| | 2 | 55 | | \$19.94 | \$7.85 | \$3.66 | \$0.00 | \$31.45 | |
| | 3 | 60 | | \$21.76 | \$7.85 | \$3.99 | \$0.00 | \$33.60 | |
| | 4 | 65 | | \$23.57 | \$7.85 | \$4.32 | \$0.00 | \$35.74 | |
| | 5 | 70 | | \$25.38 | \$7.85 | \$14.11 | \$0.00 | \$47.34 | |
| | 6 | 75 | | \$27.20 | \$7.85 | \$14.44 | \$0.00 | \$49.49 | |
| | 7 | 80 | | \$29.01 | \$7.85 | \$14.77 | \$0.00 | \$51.63 | |
| | 8 | 90 | | \$32.63 | \$7.85 | \$15.44 | \$0.00 | \$55.92 | |
| | Tree | Dete | 01/01/2015 | | | | | | |
| | Step | percent | 01/01/2015 | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate | |
| | 1 | 50 | | \$18.58 | \$7.85 | \$0.00 | \$0.00 | \$26.43 | |
| | 2 | 55 | | \$20.44 | \$7.85 | \$3.66 | \$0.00 | \$20.45 | |
| | 3 | 60 | | \$22.44 | \$7.85 | \$3.00 | \$0.00 | \$34.14 | |
| | 4 | 65 | | \$24.15 | \$7.85 | \$4.32 | \$0.00 | \$36.32 | |
| | 5 | 70 | | \$26.01 | \$7.85 | \$14.11 | \$0.00 | \$47.97 | |
| | 6 | 75 | | \$27.87 | \$7.85 | \$14.44 | \$0.00 | \$50.16 | |
| | 7 | 80 | | \$29.73 | \$7.85 | \$14.77 | \$0.00 | \$50.10 | |
| | 8 | 90 | | \$33.44 | \$7.85 | \$15.44 | \$0.00 | \$56.73 | |
| | | | | φ55.44 | φ7.05 | \$15.44 | φ0.00 | \$50.75 | |
| | Notes: | | | | | | | | |
| | Î. | Steps are | 750 hrs. | | | | | i i | |
| | Appre | ntice to Jou | rnevworker Ratio:1:1 | | | | | | |
| HOISTING EN | DISTING ENGINEER/CRANES/GRADALLS | | GRADALLS | 06/01/201/ | \$41.40 | \$10.00 | \$14.20 | \$0.00 | \$65.69 |
| OPERATING ENGL | NEERS LC | CAL 4 | | 12/01/2014 | \$47.49 | \$10.00 | \$14.20 | \$0.00 | \$66.69 |
| | | | | 06/01/2014 | \$43.24 | \$10.00 | \$14.20 | \$0.00 | \$67.44 |
| | | | | 12/01/2014 | \$44.49 | \$10.00 | \$14.20 | \$0.00 | \$68.69 |
| | | | | 06/01/2016 | \$45.24 | \$10.00 | \$14.20 | \$0.00 | \$69.44 |
| | | | | 12/01/2016 | \$46.49 | \$10.00 | \$14.20 | \$0.00 | \$70.69 |
| | | | | 06/01/2017 | \$47.49 | \$10.00 | \$14.20 | \$0.00 | \$71.69 |
| | | | | 12/01/2017 | \$48.49 | \$10.00 | \$14.20 | \$0.00 | \$72.69 |
| | | | | | | | | | |

Issue Date: 11/03/2014 Wage Request Number: 20141103-008

Page 14 of 39

| Classification | | | | | | Effective Da | te Bas | e Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------------------|------------|---------------|---------------------------|--------------|-------------|--------------|------------|----------------|------------------|----------------------------|------------------------------|--------------------|
| | Apprei | ntice - OF | PERATING E! 06/01/2014 | NGINEERS - I | Local 4 | | | | | | | |
| | Step | percent | 00/01/2014 | | Apprentice | Base Wage | Health | | Pension | Supplementa Unemploymen | t Total Rate | |
| | 1 | 55 | | | 5 | \$22.82 | \$10.00 | | \$0.00 | \$0.00 | \$32.82 | 1 |
| | 2 | 60 | | | 5 | \$24.89 | \$10.00 | | \$14.18 | \$0.00 | \$49.07 | 7 |
| | 3 | 65 | | | 5 | \$26.97 | \$10.00 | | \$14.18 | \$0.00 | \$51.15 | 5 |
| | 4 | 70 | | | 5 | \$29.04 | \$10.00 | | \$14.18 | \$0.00 | \$53.22 | |
| | 5 | 75 | | | 5 | \$31.12 | \$10.00 | | \$14.18 | \$0.00 | \$55.30 |) |
| | 6 | 80 | | | 5 | 33.19 | \$10.00 | | \$14.18 | \$0.00 | \$57.37 | , |
| | 7 | 85 | | | 5 | 35.27 | \$10.00 | | \$14.18 | \$0.00 | \$59.45 | 5 |
| | 8 | 90 | | | s | \$37.34 | \$10.00 | | \$14.18 | \$0.00 | \$61.52 | 2 |
| | Effecti | ve Date - | 12/01/2014 | | | | | | | Supplements | | |
| | Step | percent | | | Apprentice | Base Wage | Health | | Pension | Unemploymen | t Total Rate | |
| | 1 | 55 | | | 5 | \$23.37 | \$10.00 | | \$0.00 | \$0.00 | \$33.37 | 7 |
| | 2 | 60 | | | s | \$25.49 | \$10.00 | | \$14.18 | \$0.00 | \$49.67 | |
| | 3 | 65 | | | 5 | \$27.62 | \$10.00 | | \$14.18 | \$0.00 | \$51.80 |) |
| | 4 | 70 | | | 5 | \$29.74 | \$10.00 | | \$14.18 | \$0.00 | \$53.92 | 2 |
| | 5 | 75 | | | 5 | \$31.87 | \$10.00 | | \$14.18 | \$0.00 | \$56.05 | 5 |
| | 6 | 80 | | | 5 | \$33.99 | \$10.00 | | \$14.18 | \$0.00 | \$58.17 | 7 |
| | 7 | 85 | | | 5 | \$36.12 | \$10.00 | | \$14.18 | \$0.00 | \$60.30 |) |
| | 8 | 90 | | | \$ | \$38.24 | \$10.00 | | \$14.18 | \$0.00 | \$62.42 | 2 |
| | Notes | | | | | | | | | | | |
| | Notes. | | | | | | | | | | | |
| | Appre | ntice to Jou | ırneyworker | Ratio:1:6 | | | | | | | | |
| HVAC (DUCTV | VORK) | | | | | 07/01/2014 | 4 \$ | 32.32 | \$8.64 | \$14.20 | \$1.66 | \$56.82 |
| SHEETMETAL WOR | (KERS LC | KAL 03 | | | | 01/01/2015 | 5 \$ | 32.97 | \$8.64 | \$14.20 | \$1.66 | \$57.47 |
| | | | | | | 07/01/2015 | 5 \$ | 33.03 | \$8.64 | \$14.79 | \$1.66 | \$58.12 |
| | | | | | | 01/01/2016 | 5 \$ | 33.73 | \$8.64 | \$14.79 | \$1.66 | \$58.82 |
| | | | | | | 07/01/2016 | 5 \$ | 34.44 | \$8.64 | \$14.83 | \$1.66 | \$59.57 |
| For apprentice r | ates see " | Apprentice- S | HEET METAL V | ORKER" | | 01/01/2017 | 7 \$ | 35.19 | \$8.64 | \$14.83 | \$1.66 | \$60.32 |
| HVAC (ELECT | RICAL | CONTRO | .S) | | | 06/01/2014 | 4 S | 38.12 | \$7.91 | \$12.86 | \$0.00 | \$58.89 |
| ELECTRICIANS LO | CAL 96 | | | | | 12/01/2014 | 4 S | 38.37 | \$8.16 | \$13.12 | \$0.00 | \$59.65 |
| | | | | | | 06/01/2015 | 5 \$ | 38.87 | \$8.16 | \$13.62 | \$0.00 | \$60.65 |
| • | | | | | | 12/01/2015 | 5 \$ | 39.37 | \$8.41 | \$13.68 | \$0.00 | \$61.46 |
| HVAC (TESTIN | IG ANT | Apprentice- E | UNG - AID | | | 07/01/201 | | 22.22 | 60.51 | 01400 | 01 <i>66</i> | 656 02 |
| SHEETMETAL WOR | KERS LC | CAL 63 | AIIC) | | | 01/01/2014 | + \$ | 52.52 | \$8.64 | \$14.20 | \$1.00 | \$50.82 |
| | | | | | | 01/01/2013 | 2 5 | 32.97 | \$8.04 | \$14.20 | \$1.00 | \$57.47 |
| | | | | | | 01/01/2013 | > \$ | 33.03 | \$8.04 | \$14.79 \$14.70 | \$1.00 | \$38.12 |
| | | | | | | 07/01/2010 |)) (| 33.73 | \$8.04 \$9.64 | \$14.79 | \$1.00 | \$38.82 |
| | | | | | | 01/01/2017 | 5 S 7 S | 34.44 35.19 | \$8.64 \$8.64 | \$14.83 | \$1.66 | \$59.57 \$60.32 |
| Issue Date: 11 | 1/03/201 | 4 | | Wage Reque | est Number: | 2014110 | 03-008 | | | |] | Page 15 of 39 |

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental | Total Rate |
|---|----------------|-----------|---------|---------|--------------|------------|
| For apprentice rates see "Apprentice- SHEET METAL WORKER" | | | | | Unemployment | |
| HVAC (TESTING AND BALANCING -WATER) | 09/01/2014 | \$41.11 | \$9.35 | \$14.26 | \$0.00 | \$64.72 |
| PLUMBERS LOCAL 4 | 09/01/2015 | \$41.71 | \$9.35 | \$14.26 | \$0.00 | \$65.32 |
| | 03/01/2016 | \$42.36 | \$9.35 | \$14.26 | \$0.00 | \$65.97 |
| | 09/01/2016 | \$42.96 | \$9.35 | \$14.26 | \$0.00 | \$66.57 |
| | 03/01/2017 | \$43.61 | \$9.35 | \$14.26 | \$0.00 | \$67.22 |
| | 09/01/2017 | \$44.21 | \$9.35 | \$14.26 | \$0.00 | \$67.82 |
| | 03/01/2018 | \$44.86 | \$9.35 | \$14.26 | \$0.00 | \$68.47 |
| For apprentice rates see "Apprentice- PIPEFTITER" or "PLUMBER/PIPEFITTER" | | | | | | |
| HVAC MECHANIC | 09/01/2014 | \$41.11 | \$9.35 | \$14.26 | \$0.00 | \$64.72 |
| PLUMBERS LOCAL 4 | 09/01/2015 | \$41.71 | \$9.35 | \$14.26 | \$0.00 | \$65.32 |
| | 03/01/2016 | \$42.36 | \$9.35 | \$14.26 | \$0.00 | \$65.97 |
| | 09/01/2016 | \$42.96 | \$9.35 | \$14.26 | \$0.00 | \$66.57 |
| | 03/01/2017 | \$43.61 | \$9.35 | \$14.26 | \$0.00 | \$67.22 |
| | 09/01/2017 | \$44.21 | \$9.35 | \$14.26 | \$0.00 | \$67.82 |
| | 03/01/2018 | \$44.86 | \$9.35 | \$14.26 | \$0.00 | \$68.47 |
| For apprentice rates see "Apprentice- PIPEFTITER" or "PLUMBER/PIPEFITTER" | | | | | | |
| HYDRAULIC DRILLS | 06/01/2014 | \$31.10 | \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| LABORERS - ZONE Z | 12/01/2014 | \$31.60 | \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | 06/01/2015 | \$32.10 | \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | 12/01/2015 | \$32.60 | \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | 06/01/2016 | \$33.10 | \$7.30 | \$12.10 | \$0.00 | \$52.50 |
| | 12/01/2016 | \$33.85 | \$7.30 | \$12.10 | \$0.00 | \$53.25 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| INSULATOR (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 (WORCESTER) | 09/01/2014 | \$38.98 | \$11.25 | \$12.60 | \$0.00 | \$62.83 |

| Apprentice - | ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Worcester |
|--------------|--|
| | |

| Effecti | ve Date - 09/01/2014 | | | | Supplemental | | |
|---|----------------------------------|----------------------|---------|---------|--------------|------------|---------|
| Step | percent | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| 1 | 50 | \$19.49 | \$11.25 | \$9.35 | \$0.00 | \$40.09 | |
| 2 | 60 | \$23.39 | \$11.25 | \$10.00 | \$0.00 | \$44.64 | |
| 3 | 70 | \$27.29 | \$11.25 | \$10.65 | \$0.00 | \$49.19 | |
| 4 | 80 | \$31.18 | \$11.25 | \$11.30 | \$0.00 | \$53.73 | |
| Notes: | | | | | | | |
| 1 | Steps are 1 year | | | | | | |
| Appre | ntice to Journeyworker Ratio:1:4 | | | | | | |
| IRONWORKER/WELI IRONWORKERS LOCAL 7 (W | DER VORCESTER AREA) | 03/16/2014 | \$40.89 | \$7.70 | \$19.25 | \$0.00 | \$67.84 |

| Classification | | | Effective Dat | e Base Wag | e Health | Pension U | Jupplemental Jnemployment | Total Rate |
|--------------------------------------|-------------------|---|---------------------|------------|----------|--------------|------------------------------|------------|
| | Appre: Effecti | ntice - IRONWORKER - Local 7 ive Date - 03/16/2014 | Vorcester | 11-14 | Density | Supplemental | T-(-1 D-(- | |
| | step | percent | Apprenuce Base wage | Health | Pension | Onempioyment | I otal Kate | |
| | 1 | 60 | \$24.53 | \$7.70 | \$19.25 | \$0.00 | \$51.48 | |
| | 2 | 70 | \$28.62 | \$7.70 | \$19.25 | \$0.00 | \$55.57 | |
| | 3 | 75 | \$30.67 | \$7.70 | \$19.25 | \$0.00 | \$57.62 | |
| | 4 | 80 | \$32.71 | \$7.70 | \$19.25 | \$0.00 | \$59.66 | |
| | 5 | 85 | \$34.76 | \$7.70 | \$19.25 | \$0.00 | \$61.71 | |
| | 6 | 90 | \$36.80 | \$7.70 | \$19.25 | \$0.00 | \$63.75 | |
| | Notes: | Structural 1:6; Ornamental 1:4 ntice to Journeyworker Ratio: | | | | | | |
| JACKHAMMER & PAVING BREAKER OPERATOR | | | 06/01/2014 | \$30.60 | \$7.30 | \$12.10 | \$0.00 | \$50.00 |
| LABORERS - ZOM | 52 | | 12/01/2014 | \$31.10 | \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| | | | 06/01/2015 | \$31.60 | \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | | | 12/01/2015 | \$32.10 | \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | | | 06/01/2016 | \$32.60 | \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | | | 12/01/2016 | \$33.35 | \$7.30 | \$12.10 | \$0.00 | \$52.75 |
| For apprentice | rates see ' | 'Apprentice- LABORER" | | | | | | |
| LABORER _ ZOM | 7 2 | | 06/01/2014 | \$30.35 | \$7.30 | \$12.10 | \$0.00 | \$49.75 |
| 21201010-2011 | | | 12/01/2014 | \$30.85 | \$7.30 | \$12.10 | \$0.00 | \$50.25 |
| | | | 06/01/2015 | \$31.35 | \$7.30 | \$12.10 | \$0.00 | \$50.75 |
| | | | 12/01/2015 | \$31.85 | \$7.30 | \$12.10 | \$0.00 | \$51.25 |
| | | | 06/01/2016 | \$32.35 | \$7.30 | \$12.10 | \$0.00 | \$51.75 |
| | | | 12/01/2016 | \$33.10 | \$7.30 | \$12.10 | \$0.00 | \$52.50 |

Issue Date: 11/03/2014 Wage Request Number: 20141103-008

Page 17 of 39
| Classification | | | | | Effective Dat | e Base Wag | e Health | Pension | Supplemental Unemployment | Total Rate |
|----------------|---------------|-----------------|------------------------------|--------------|---------------|------------|----------|----------------------------|------------------------------|---------------|
| | | | DODED 7 | | | | | | | |
| | Appre | ntice - LA | BORER - Zone 2 06/01/2014 | | | | | | | |
| | Step | percent | 00,01,2014 | Apprentice 1 | Base Wage | Health | Pension | Supplementa Unemploymen | 1 t Total Ra | ate |
| | 1 | 60 | | \$ | 18.21 | \$7.30 | \$12.10 | \$0.00 | \$37. | 61 |
| | 2 | 70 | | \$: | 21.25 | \$7.30 | \$12.10 | \$0.00 | \$40. | 65 |
| | 3 | 80 | | \$2 | 24.28 | \$7.30 | \$12.10 | \$0.00 | \$43. | 68 |
| | 4 | 90 | | \$2 | 27.32 | \$7.30 | \$12.10 | \$0.00 | \$46. | 72 |
| | Effect | ve Date - | 12/01/2014 | | | | | Come la mante | | |
| | Step | percent | | Apprentice 1 | Base Wage | Health | Pension | Unemploymen | t Total Ra | ate |
| | 1 | 60 | | \$ | 18.51 | \$7.30 | \$12.10 | \$0.00 | \$37. | 91 |
| | 2 | 70 | | \$2 | 21.60 | \$7.30 | \$12.10 | \$0.00 | \$41. | 00 |
| | 3 | 80 | | \$2 | 24.68 | \$7.30 | \$12.10 | \$0.00 | \$44. | 08 |
| | 4 | 90 | | \$2 | 27.77 | \$7.30 | \$12.10 | \$0.00 | \$47. | 17 |
| | Notes: | | | | | | | | | 1 |
| | i i | | | | | | | | | |
| | Appre | ntice to Joi | rneyworker Ratio:1:5 | | | | | | | _ |
| LABORER: CA | ARPENT | ER TEND | ER | | 06/01/2014 | \$30.35 | \$7.30 | \$12.10 | \$0.00 | \$49.75 |
| LABORERS - ZON | E 2 | | | | 12/01/2014 | \$30.85 | \$7.30 | \$12.10 | \$0.00 | \$50.25 |
| | | | | | 06/01/2015 | \$31.35 | \$7.30 | \$12.10 | \$0.00 | \$50.75 |
| | | | | | 12/01/2015 | \$31.85 | \$7.30 | \$12.10 | \$0.00 | \$51.25 |
| | | | | | 06/01/2016 | \$32.35 | \$7.30 | \$12.10 | \$0.00 | \$51.75 |
| | | | | | 12/01/2016 | \$33.10 | \$7.30 | \$12.10 | \$0.00 | \$52.50 |
| For apprentice | e rates see ' | 'Apprentice- L | ABORER" | | | | | | | |
| LABORERS - ZON | EMENT E 2 | FINISHER | IENDER | | 06/01/2014 | \$30.35 | \$7.30 | \$12.10 | \$0.00 | \$49.75 |
| | | | | | 12/01/2014 | \$30.85 | \$7.30 | \$12.10 | \$0.00 | \$50.25 |
| | | | | | 12/01/2015 | \$31.33 | \$7.30 | \$12.10 | \$0.00 | \$50.75 |
| | | | | | 06/01/2015 | \$32.35 | \$7.30 | \$12.10 | \$0.00 | \$51.25 |
| | | | | | 12/01/2016 | \$33.10 | \$7.30 | \$12.10 | \$0.00 | \$52.50 |
| For apprentice | e rates see ' | 'Apprentice - L | ABORER" | | 12.01/2010 | 400.10 | \$7.50 | | \$0.00 | 402.00 |
| LABORER: H. | AZARD | OUS WAST | FE/ASBESTOS REMOVER | Ł | 06/01/2014 | \$30.55 | \$7.30 | \$12.05 | \$0.00 | \$49.90 |
| LABORERS - ZON | E 2 | | | | 12/01/2014 | \$31.05 | \$7.30 | \$12.05 | \$0.00 | \$50.40 |
| | | | | | 06/01/2015 | \$31.55 | \$7.30 | \$12.05 | \$0.00 | \$50.90 |
| For apprentice | matar cas | Apprentice- I | ABORED" | | 12/01/2015 | \$32.05 | \$7.30 | \$12.05 | \$0.00 | \$51.40 |
| LABORER: M | ASON 7 | ENDER | NUVAER | | 06/01/2014 | \$20.60 | \$7.30 | \$12.10 | \$0.00 | \$50.00 |
| LABORERS - ZON | E 2 | | | | 12/01/2014 | \$31.10 | \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| | | | | | 06/01/2014 | \$31.60 | \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | | | | | 12/01/2015 | \$32.10 | \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | | | | | 06/01/2016 | \$32.60 | \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | | | | | 12/01/2016 | \$33.35 | \$7.30 | \$12.10 | \$0.00 | \$52.75 |
| For apprentice | e rates see ' | 'Apprentice- L | ABORER" | | | | | | | |
| Issue Date: | 1/03/20 | 14 | Wage Reque | st Number: | 2014110 | 3-008 | | | | Page 18 of 39 |
| | | | B1 | | | | | | | |

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|--|------------------|---------------|----------------------------|------------------------------|------------|
| LABORER: MULTI-TRADE TENDER | 06/01/2014 | \$30.35 | \$7.30 | \$12.10 | \$0.00 | \$49.75 |
| LABORERS - ZONE 2 | 12/01/2014 | \$30.85 | \$7.30 | \$12.10 | \$0.00 | \$50.25 |
| | 06/01/2015 | \$31.35 | \$7.30 | \$12.10 | \$0.00 | \$50.75 |
| | 12/01/2015 | \$31.85 | \$7.30 | \$12.10 | \$0.00 | \$51.25 |
| | 06/01/2016 | \$32.35 | \$7.30 | \$12.10 | \$0.00 | \$51.75 |
| | 12/01/2016 | \$33.10 | \$7.30 | \$12.10 | \$0.00 | \$52.50 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| LABORER: TREE REMOVER | 06/01/2014 | \$30.35 | \$7.30 | \$12.10 | \$0.00 | \$49.75 |
| LABORERS-20NE 2 | 12/01/2014 | \$30.85 | \$7.30 | \$12.10 | \$0.00 | \$50.25 |
| | 06/01/2015 | \$31.35 | \$7.30 | \$12.10 | \$0.00 | \$50.75 |
| | 12/01/2015 | \$31.85 | \$7.30 | \$12.10 | \$0.00 | \$51.25 |
| | 06/01/2016 | \$32.35 | \$7.30 | \$12.10 | \$0.00 | \$51.75 |
| | 12/01/2016 | \$33.10 | \$7.30 | \$12.10 | \$0.00 | \$52.50 |
| This classification applies to all tree work associated with the removal of standing a utility company for the purpose of operation, maintenance or renair of utility cor | trees, and trimming and ren n pany equipment. For appre | noval of branche | s and limbs w | hen the work is ABORER" | s not done for | |
| LASER BEAM OPERATOR | 06/01/2014 | \$30.60 | \$7.30 | \$12.10 | \$0.00 | \$50.00 |
| LABORERS - ZONE 2 | 12/01/2014 | \$31.10 | \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| | 06/01/2015 | \$31.60 | \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | 12/01/2015 | \$32.10 | \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | 06/01/2016 | \$32.60 | \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | 12/01/2016 | \$33.35 | \$7.30 | \$12.10 | \$0.00 | \$52.75 |
| For apprentice rates see "Apprentice- LABORER" | 12.01.2010 | 000100 | 07.50 | | | 002.10 |
| MARBLE & TILE FINISHERS | 08/01/2014 | \$37.37 | \$10.18 | \$16.90 | \$0.00 | \$64.45 |
| BRICKLAYERS LOCAL 3 (WORCESTER) - MARBLE & TILE | 02/01/2015 | \$37.82 | \$10.18 | \$16.90 | \$0.00 | \$64.90 |
| | 08/01/2015 | \$38.53 | \$10.18 | \$16.97 | \$0.00 | \$65.68 |
| | 02/01/2016 | \$38.98 | \$10.18 | \$16.97 | \$0.00 | \$66.13 |
| | 08/01/2016 | \$39.68 | \$10.18 | \$17.05 | \$0.00 | \$66.91 |
| | 02/01/2017 | \$40.14 | \$10.18 | \$17.05 | \$0.00 | \$67.37 |
| | | | | | | |

| Classification | | | | Effective Da | te Base Wag | ge Health | Pension | Supplemental Unemployment | Total Rate |
|----------------|---------------------------|-----------------------------------|-------------------------------------|---|-------------|-----------|----------------------------|------------------------------|------------|
| | Apprei Effecti Step | ntice - M ve Date - percent | ARBLE & TILE FINISHER 08/01/2014 | - Local 3 Marble & Tile Apprentice Base Wage | Health | Pension | Supplementa Unemploymen | d 1 Total Rate | |
| | 1 | 50 | | \$18.69 | \$10.18 | \$16.90 | \$0.00 | \$45.77 | |
| | 2 | 60 | | \$22.42 | \$10.18 | \$16.90 | \$0.00 | \$49.50 | |
| | 3 | 70 | | \$26.16 | \$10.18 | \$16.90 | \$0.00 | \$53.24 | |
| | 4 | 80 | | \$29.90 | \$10.18 | \$16.90 | \$0.00 | \$56.98 | |
| | 5 | 90 | | \$33.63 | \$10.18 | \$16.90 | \$0.00 | \$60.71 | |
| | Effecti Step | ve Date - percent | 02/01/2015 | Apprentice Base Wage | Health | Pension | Supplementa Unemploymen | a t Total Rate | |
| | 1 | 50 | | \$18.91 | \$10.18 | \$16.90 | \$0.00 |) \$45.99 | |
| | 2 | 60 | | \$22.69 | \$10.18 | \$16.90 | \$0.00 | \$49.77 | |
| | 3 | 70 | | \$26.47 | \$10.18 | \$16.90 | \$0.00 | \$53.55 | |
| | 4 | 80 | | \$30.26 | \$10.18 | \$16.90 | \$0.00 | \$57.34 | |
| | 5 | 90 | | \$34.04 | \$10.18 | \$16.90 | \$0.00 | \$61.12 | |
| | Notes: | | | | | | | | |
| | Appre | ntice to Jo | urneyworker Ratio:1:3 | | | | | | |
| MARBLE MAS | SONS,TI | LELAYE | RS & TERRAZZO MECH | 09/01/2014 | 4 \$47.42 | \$10.18 | \$17.62 | \$0.00 | \$75.22 |
| BRICKLAYERS LO | CAL 3 (WO | ORCESTER) - | MARBLE & TILE | 03/01/201: | 5 \$47.98 | \$10.18 | \$17.62 | \$0.00 | \$75.78 |
| | | | | 09/01/201 | 5 \$48.88 | \$10.18 | \$17.69 | \$0.00 | \$76.75 |
| | | | | 03/01/2010 | \$ \$49.45 | \$10.18 | \$17.69 | \$0.00 | \$77.32 |
| | | | | 09/01/2010 | 5 \$50.35 | \$10.18 | \$17.77 | \$0.00 | \$78.30 |
| | | | | 03/01/2012 | 7 \$50.92 | \$10.18 | \$17.77 | \$0.00 | \$78.87 |

| Classification | | | | Effective Da | ite Base Wag | e Health | Pension | Supplemental Unemployment | Total Rate |
|----------------|------------------|---------------|--|-----------------------|-----------------|----------|--------------|------------------------------|------------|
| | Appre Effecti | ntice - | MARBLE-TILE-TERRAZZO N - 09/01/2014 | AECHANIC - Local 3 Ma | urble & Tile (W | Torc) | | | |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Supplementa | Total Rate | |
| | 1 | 50 | | \$23.71 | \$10.18 | \$17.62 | \$0.00 | \$51.51 | |
| | 2 | 60 | | \$28.45 | \$10.18 | \$17.62 | \$0.00 | \$56.25 | |
| | 3 | 70 | | \$33.19 | \$10.18 | \$17.62 | \$0.00 | \$60.99 | |
| | 4 | 80 | | \$37.94 | \$10.18 | \$17.62 | \$0.00 | \$65.74 | |
| | 5 | 90 | | \$42.68 | \$10.18 | \$17.62 | \$0.00 | \$70.48 | |
| | Effecti | ive Date - | 03/01/2015 | | | | Supplementa | C | |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| | 1 | 50 | | \$23.99 | \$10.18 | \$17.62 | \$0.00 | \$51.79 | |
| | 2 | 60 | | \$28.79 | \$10.18 | \$17.62 | \$0.00 | \$56.59 | |
| | 3 | 70 | | \$33.59 | \$10.18 | \$17.62 | \$0.00 | \$61.39 | |
| | 4 | 80 | | \$38.38 | \$10.18 | \$17.62 | \$0.00 | \$66.18 | |
| | 5 | 90 | | \$43.18 | \$10.18 | \$17.62 | \$0.00 | \$70.98 | |
| | Notes: | | | | | | | | |
| | i – | | | | | | | | |
| | Appre | ntice to J | Journeyworker Ratio:1:5 | | | | | | |
| MECH. SWEEL | PER OP | ERATOF | R (ON CONST. SITES) | 06/01/2014 | 4 \$41.10 | \$10.00 | \$14.20 | \$0.00 | \$65.30 |
| OPERATING ENGL | NEERS LO | OCAL 4 | | 12/01/2014 | 4 \$42.09 | \$10.00 | \$14.20 | \$0.00 | \$66.29 |
| | | | | 06/01/201 | 5 \$42.83 | \$10.00 | \$14.20 | \$0.00 | \$67.03 |
| | | | | 12/01/2013 | 5 \$44.07 | \$10.00 | \$14.20 | \$0.00 | \$68.27 |
| | | | | 06/01/2010 | 6 \$44.82 | \$10.00 | \$14.20 | \$0.00 | \$69.02 |
| | | | | 12/01/2010 | 5 \$46.05 | \$10.00 | \$14.20 | \$0.00 | \$70.25 |
| | | | | 06/01/2011 | 7 \$47.04 | \$10.00 | \$14.20 | \$0.00 | \$71.24 |
| For apprentice | rates see ' | 'Apprentice | - OPERATING ENGINEERS" | 12/01/2017 | 7 \$48.03 | \$10.00 | \$14.20 | \$0.00 | \$72.23 |
| MECHANICS | MAINT | ENANCI | 3 | 06/01/2014 | 4 \$41.10 | \$10.00 | \$14.20 | \$0.00 | \$65.30 |
| OPERATING ENGL | NEERS LO | OCAL 4 | | 12/01/2014 | 4 \$42.09 | \$10.00 | \$14.20 | \$0.00 | \$66.29 |
| | | | | 06/01/201: | 5 \$42.83 | \$10.00 | \$14.20 | \$0.00 | \$67.03 |
| | | | | 12/01/2015 | 5 \$44.07 | \$10.00 | \$14.20 | \$0.00 | \$68.27 |
| | | | | 06/01/2010 | 5 \$44.82 | \$10.00 | \$14.20 | \$0.00 | \$69.02 |
| | | | | 12/01/2010 | \$46.05 | \$10.00 | \$14.20 | \$0.00 | \$70.25 |
| | | | | 06/01/2012 | 7 \$47.04 | \$10.00 | \$14.20 | \$0.00 | \$71.24 |
| | | | | 12/01/2017 | 7 \$48.03 | \$10.00 | \$14.20 | \$0.00 | \$72.23 |
| For apprentice | rates see ' | 'Apprentice | - OPERATING ENGINEERS" | | | | | | |
| MILLWRIGHT | (Zone | 3) - 70m 2 | | 10/01/2014 | 4 \$32.38 | \$9.80 | \$16.21 | \$0.00 | \$58.39 |
| | SHD 1121 | Londe 3 | | 04/01/201: | 5 \$33.13 | \$9.80 | \$16.21 | \$0.00 | \$59.14 |

Classification

REGIONAL EMERGENCY COMMUNICATIONE CENTER

| Classification | | | | Effective Dat | e Base Wage | e Health | Pension | Supplemental Unemployment | Total Rate |
|-----------------|-------------|----------------------|-------------------------|----------------------|-------------|----------|------------------------------|------------------------------|---------------|
| | Appre | ntice - M | LLWRIGHT - Local 1121 2 | Cone 3 | | | | | |
| | Step | ve Date - percent | 10/01/2014 | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate | |
| | 1 | 55 | | \$17.81 | \$9.80 | \$4.48 | \$0.00 | \$32.09 | |
| | 2 | 65 | | \$21.05 | \$9.80 | \$13.36 | \$0.00 | \$44.21 | |
| | 3 | 75 | | \$24.29 | \$9.80 | \$14.18 | \$0.00 | \$48.27 | |
| | 4 | 85 | | \$27.52 | \$9.80 | \$14.99 | \$0.00 | \$52.31 | |
| | Effecti | ve Date - | 04/01/2015 | | | | Supplemental | | |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| | 1 | 55 | | \$18.22 | \$9.80 | \$4.48 | \$0.00 | \$32.50 | |
| | 2 | 65 | | \$21.53 | \$9.80 | \$13.36 | \$0.00 | \$44.69 | |
| | 3 | 75 | | \$24.85 | \$9.80 | \$14.18 | \$0.00 | \$48.83 | |
| | 4 | 85 | | \$28.16 | \$9.80 | \$14.99 | \$0.00 | \$52.95 | |
| | Notes: | Steps are | 2 000 hours | | | | | | |
| | Appre | ntice to Jo | urneyworker Ratio:1:5 | | | | | | |
| MORTAR MIX | ER | | | 06/01/2014 | \$30.60 | \$7.30 | \$12.10 | \$0.00 | \$50.00 |
| LABORERS - ZONE | 2 | | | 12/01/2014 | \$31.10 | \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| | | | | 06/01/2015 | \$31.60 | \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | | | | 12/01/2015 | \$32.10 | \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | | | | 06/01/2016 | \$32.60 | \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | | | | 12/01/2016 | \$33.35 | \$7.30 | \$12.10 | \$0.00 | \$52.75 |
| For apprentice | rates see " | Apprentice- L | ABORER" | | | | | | |
| OILER (OTHER | THAN | TRUCK | CRANES,GRADALLS) | 06/01/2014 | \$21.48 | \$10.00 | \$14.20 | \$0.00 | \$45.68 |
| OPERALING BINGL | VEEKS LC | AL 4 | | 12/01/2014 | \$22.00 | \$10.00 | \$14.20 | \$0.00 | \$46.20 |
| | | | | 06/01/2015 | \$22.38 | \$10.00 | \$14.20 | \$0.00 | \$46.58 |
| | | | | 12/01/2015 | \$23.03 | \$10.00 | \$14.20 | \$0.00 | \$47.23 |
| | | | | 06/01/2016 | \$23.42 | \$10.00 | \$14.20 | \$0.00 | \$47.62 |
| | | | | 12/01/2016 | \$24.07 | \$10.00 | \$14.20 | \$0.00 | \$48.27 |
| | | | | 06/01/2017 | \$24.58 | \$10.00 | \$14.20 | \$0.00 | \$48.78 |
| For apprentice | rates see " | Apprentice- C | PERATING ENGINEERS" | 12/01/2017 | \$25.10 | \$10.00 | \$14.20 | \$0.00 | \$49.30 |
| OILER (TRUCH | CRAN | NES, GRAI | DALLS) | 06/01/2014 | \$25.03 | \$10.00 | \$14.20 | \$0.00 | \$49.23 |
| OPERATING ENGL | VEERS LO | OCAL 4 | | 12/01/2014 | \$25.64 | \$10.00 | \$14.20 | \$0.00 | \$49.84 |
| | | | | 06/01/2015 | \$26.09 | \$10.00 | \$14.20 | \$0.00 | \$50.29 |
| | | | | 12/01/2015 | \$26.84 | \$10.00 | \$14.20 | \$0.00 | \$51.04 |
| | | | | 06/01/2016 | \$27.30 | \$10.00 | \$14.20 | \$0.00 | \$51.50 |
| | | | | 12/01/2016 | \$28.05 | \$10.00 | \$14.20 | \$0.00 | \$52.25 |
| | | | | 06/01/2017 | \$28.65 | \$10.00 | \$14.20 | \$0.00 | \$52.85 |
| | | | | 12/01/2017 | \$29.26 | \$10.00 | \$14.20 | \$0.00 | \$53.46 |
| For apprentice | rates see " | Apprentice- C | PERATING ENGINEERS" | | | | | | |
| Issue Date: 1 | 1/03/201 | 14 | Wage Requ | est Number: 2014110 | 3-008 | | | F | Page 22 of 39 |

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|------------|
| OTHER POWER DRIVEN EQUIPMENT - CLASS II | 06/01/2014 | \$41.10 | \$10.00 | \$14.20 | \$0.00 | \$65.30 |
| OPERATING ENGINEERS LOCAL 4 | 12/01/2014 | \$42.09 | \$10.00 | \$14.20 | \$0.00 | \$66.29 |
| | 06/01/2015 | \$42.83 | \$10.00 | \$14.20 | \$0.00 | \$67.03 |
| | 12/01/2015 | \$44.07 | \$10.00 | \$14.20 | \$0.00 | \$68.27 |
| | 06/01/2016 | \$44.82 | \$10.00 | \$14.20 | \$0.00 | \$69.02 |
| | 12/01/2016 | \$46.05 | \$10.00 | \$14.20 | \$0.00 | \$70.25 |
| | 06/01/2017 | \$47.04 | \$10.00 | \$14.20 | \$0.00 | \$71.24 |
| | 12/01/2017 | \$48.03 | \$10.00 | \$14.20 | \$0.00 | \$72.23 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | | | | | | |
| PAINTER (BRIDGES/TANKS) | 07/01/2014 | \$46.76 | \$7.85 | \$16.10 | \$0.00 | \$70.71 |
| PAINTERS LOCAL 33 - ZONE 2 | 01/01/2015 | \$47.66 | \$7.85 | \$16.10 | \$0.00 | \$71.61 |
| | 07/01/2015 | \$48.56 | \$7.85 | \$16.10 | \$0.00 | \$72.51 |
| | 01/01/2016 | \$49.51 | \$7.85 | \$16.10 | \$0.00 | \$73.46 |
| | 07/01/2016 | \$50.46 | \$7.85 | \$16.10 | \$0.00 | \$74.41 |
| | 01/01/2017 | \$51.41 | \$7.85 | \$16.10 | \$0.00 | \$75.36 |

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

| Effect | ive Date - 07/01/2014 | | | | Supplemental | | |
|--------|-----------------------|----------------------|--------|---------|--------------|------------|--|
| Step | percent | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| 1 | 50 | \$23.38 | \$7.85 | \$0.00 | \$0.00 | \$31.23 | |
| 2 | 55 | \$25.72 | \$7.85 | \$3.66 | \$0.00 | \$37.23 | |
| 3 | 60 | \$28.06 | \$7.85 | \$3.99 | \$0.00 | \$39.90 | |
| 4 | 65 | \$30.39 | \$7.85 | \$4.32 | \$0.00 | \$42.56 | |
| 5 | 70 | \$32.73 | \$7.85 | \$14.11 | \$0.00 | \$54.69 | |
| 6 | 75 | \$35.07 | \$7.85 | \$14.44 | \$0.00 | \$57.36 | |
| 7 | 80 | \$37.41 | \$7.85 | \$14.77 | \$0.00 | \$60.03 | |
| 8 | 90 | \$42.08 | \$7.85 | \$15.44 | \$0.00 | \$65.37 | |

| Effect | ive Date - | 01/01/2015 | | | | Supplemental | |
|--------|------------|------------|----------------------|--------|---------|--------------|------------|
| Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate |
| 1 | 50 | | \$23.83 | \$7.85 | \$0.00 | \$0.00 | \$31.68 |
| 2 | 55 | | \$26.21 | \$7.85 | \$3.66 | \$0.00 | \$37.72 |
| 3 | 60 | | \$28.60 | \$7.85 | \$3.99 | \$0.00 | \$40.44 |
| 4 | 65 | | \$30.98 | \$7.85 | \$4.32 | \$0.00 | \$43.15 |
| 5 | 70 | | \$33.36 | \$7.85 | \$14.11 | \$0.00 | \$55.32 |
| 6 | 75 | | \$35.75 | \$7.85 | \$14.44 | \$0.00 | \$58.04 |
| 7 | 80 | | \$38.13 | \$7.85 | \$14.77 | \$0.00 | \$60.75 |
| 8 | 90 | | \$42.89 | \$7.85 | \$15.44 | \$0.00 | \$66.18 |
| Notes: | | | | | | | |
| | Ctana ara | 750 hm | | | | | 1 |

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

 Issue Date:
 11/03/2014
 Wage Request Number:
 20141103-008

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|--------|---------|------------------------------|------------|
| PAINTER (SPRAY OR SANDBLAST, NEW) * | 07/01/2014 | \$37.66 | \$7.85 | \$16.10 | \$0.00 | \$61.61 |
| * If 30% or more of surfaces to be painted are new construction, | 01/01/2015 | \$38.56 | \$7.85 | \$16.10 | \$0.00 | \$62.51 |
| NEW paint rate shall be used. PAINERS LOCAL 55 - 20NB 2 | 07/01/2015 | \$39.46 | \$7.85 | \$16.10 | \$0.00 | \$63.41 |
| | 01/01/2016 | \$40.41 | \$7.85 | \$16.10 | \$0.00 | \$64.36 |
| | 07/01/2016 | \$41.36 | \$7.85 | \$16.10 | \$0.00 | \$65.31 |
| | 01/01/2017 | \$42.31 | \$7.85 | \$16.10 | \$0.00 | \$66.26 |

Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - New Effective Date - 07/01/2014

| Enter | ave Date - onour out | | | | Supplemental | | |
|-------|----------------------|----------------------|--------|---------|--------------|------------|--|
| Step | percent | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| 1 | 50 | \$18.83 | \$7.85 | \$0.00 | \$0.00 | \$26.68 | |
| 2 | 55 | \$20.71 | \$7.85 | \$3.66 | \$0.00 | \$32.22 | |
| 3 | 60 | \$22.60 | \$7.85 | \$3.99 | \$0.00 | \$34.44 | |
| 4 | 65 | \$24.48 | \$7.85 | \$4.32 | \$0.00 | \$36.65 | |
| 5 | 70 | \$26.36 | \$7.85 | \$14.11 | \$0.00 | \$48.32 | |
| 6 | 75 | \$28.25 | \$7.85 | \$14.44 | \$0.00 | \$50.54 | |
| 7 | 80 | \$30.13 | \$7.85 | \$14.77 | \$0.00 | \$52.75 | |
| 8 | 90 | \$33.89 | \$7.85 | \$15.44 | \$0.00 | \$57.18 | |
| | | | | | | | |

| Effecti | ve Date - | 01/01/2015 | | | | Supplemental | | |
|---------|--------------|----------------------|----------------------|--------|---------|--------------|------------|--|
| Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| 1 | 50 | | \$19.28 | \$7.85 | \$0.00 | \$0.00 | \$27.13 | |
| 2 | 55 | | \$21.21 | \$7.85 | \$3.66 | \$0.00 | \$32.72 | |
| 3 | 60 | | \$23.14 | \$7.85 | \$3.99 | \$0.00 | \$34.98 | |
| 4 | 65 | | \$25.06 | \$7.85 | \$4.32 | \$0.00 | \$37.23 | |
| 5 | 70 | | \$26.99 | \$7.85 | \$14.11 | \$0.00 | \$48.95 | |
| 6 | 75 | | \$28.92 | \$7.85 | \$14.44 | \$0.00 | \$51.21 | |
| 7 | 80 | | \$30.85 | \$7.85 | \$14.77 | \$0.00 | \$53.47 | |
| 8 | 90 | | \$34.70 | \$7.85 | \$15.44 | \$0.00 | \$57.99 | |
| Notes: | Steps are | 750 hrs. | | | | | | |
| Appre | ntice to Jou | rneyworker Ratio:1:1 | | | | | | |

PAINTER (SPRAY OR SANDBLAST, REPAINT)

PAINTERS LOCAL 35 - ZONE 2

| 07/01/2014 | \$35.72 | \$7.85 | \$16.10 | \$0.00 | \$59.67 |
|------------|---------|--------|---------|--------|---------|
| 01/01/2015 | \$36.62 | \$7.85 | \$16.10 | \$0.00 | \$60.57 |
| 07/01/2015 | \$37.52 | \$7.85 | \$16.10 | \$0.00 | \$61.47 |
| 01/01/2016 | \$38.47 | \$7.85 | \$16.10 | \$0.00 | \$62.42 |
| 07/01/2016 | \$39.42 | \$7.85 | \$16.10 | \$0.00 | \$63.37 |
| 01/01/2017 | \$40.37 | \$7.85 | \$16.10 | \$0.00 | \$64.32 |

| Classification | | | | Effective Dat | e Base Wag | e Health | Pension | Supplemental Unemployment | Total Rate |
|--------------------------------|-----------------|-------------|--|---------------------------------------|------------|----------|------------------------------|------------------------------|------------|
| | Annrei | ntice - PA | AINTER Local 35 Zone 2 - Su | prav/Sandblast - Repaint | | | | | |
| | Effecti | ve Date - | 07/01/2014 | · · · · · · · · · · · · · · · · · · · | | | Supplemental | | |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | ; |
| | 1 | 50 | | \$17.86 | \$7.85 | \$0.00 | \$0.00 | \$25.71 | |
| | 2 | 55 | | \$19.65 | \$7.85 | \$3.66 | \$0.00 | \$31.16 | |
| | 3 | 60 | | \$21.43 | \$7.85 | \$3.99 | \$0.00 | \$33.27 | |
| | 4 | 65 | | \$23.22 | \$7.85 | \$4.32 | \$0.00 | \$35.39 | |
| | 5 | 70 | | \$25.00 | \$7.85 | \$14.11 | \$0.00 | \$46.96 | |
| | 6 | 75 | | \$26.79 | \$7.85 | \$14.44 | \$0.00 | \$49.08 | |
| | 7 | 80 | | \$28.58 | \$7.85 | \$14.77 | \$0.00 | \$51.20 | |
| | 8 | 90 | | \$32.15 | \$7.85 | \$15.44 | \$0.00 | \$55.44 | ļ |
| | Effecti Sten | ve Date - | 01/01/2015 | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate | |
| | 1 | 50 | | \$19.21 | \$7.85 | \$0.00 | \$0.00 | \$26.16 | |
| | 2 | 55 | | \$20.14 | \$7.85 | \$3.66 | \$0.00 | \$20.10 | |
| | 3 | 60 | | \$20.14 | \$7.85 | \$3.00 | \$0.00 | \$31.00 | |
| | 4 | 65 | | \$23.80 | \$7.85 | \$4.32 | \$0.00 | \$35.01 | , |
| | 5 | 70 | | \$25.63 | \$7.85 | \$14.11 | \$0.00 | \$47.50 | |
| | 6 | 75 | | \$25.05 | \$7.85 | \$14.11 | \$0.00 | \$47.55 | |
| | 7 | 80 | | \$29.30 | \$7.85 | \$14.77 | \$0.00 | \$51.00 | |
| | 8 | 90 | | \$32.96 | \$7.85 | \$15.44 | \$0.00 | \$56.25 | |
| | Notes: | | | | | | | | |
| | | Steps are | 750 hrs. | | | | | 1 | |
| | Appre | ntice to Jo | urneyworker Ratio:1:1 | | | | | | |
| PAINTER (TR. | AFFIC N | IARKING | S) | 06/01/2014 | \$30.35 | \$7.30 | \$12.10 | \$0.00 | \$49.75 |
| LABORERS - ZONI | 32 | | | 12/01/2014 | \$30.85 | \$7.30 | \$12.10 | \$0.00 | \$50.25 |
| | | | | 06/01/2015 | \$31.35 | \$7.30 | \$12.10 | \$0.00 | \$50.75 |
| | | | | 12/01/2015 | \$31.85 | \$7.30 | \$12.10 | \$0.00 | \$51.25 |
| | | | | 06/01/2016 | \$32.35 | \$7.30 | \$12.10 | \$0.00 | \$51.75 |
| | | | | 12/01/2016 | \$33.10 | \$7.30 | \$12.10 | \$0.00 | \$52.50 |
| For Apprentic | e rates see | Apprentice- | LABORER" | | | | | | |
| PAINTER / TA * If 30% or mo | PER (B) | RUSH, NE | W) * nainted are new construction | 07/01/2014 | \$36.26 | \$7.85 | \$16.10 | \$0.00 | \$60.21 |
| NEW paint rate | shall be | used. PAIN | Particulare new construction TERS LOCAL 35 - ZONE 2 | 01/01/2015 | \$37.16 | \$7.85 | \$16.10 | \$0.00 | \$61.11 |
| | | | | 07/01/2015 | \$38.06 | \$7.85 | \$16.10 | \$0.00 | \$62.01 |
| | | | | 01/01/2016 | \$39.01 | \$7.85 | \$16.10 | \$0.00 | \$62.96 |
| | | | | 07/01/2016 | \$39.96 | \$7.85 | \$16.10 | \$0.00 | \$63.91 |
| | | | | 01/01/2017 | \$40.91 | \$7.85 | \$16.10 | \$0.00 | \$64.86 |

| Issue Date: | 11/03/2014 | Wage Request Number: | 20141103-008 | Page 25 of 39 |
|-------------|------------|----------------------|--------------|---------------|
| | | | | |

| Classification | | | | Effective Da | te Base Wag | e Health | Pension | Supplemental Unemployment | Total Rate |
|----------------|----------|-------------|---|----------------------|-------------|----------|--------------|------------------------------|------------|
| | Appre | ntice - PA | UNTER - Local 35 Zone 2 - 07/01/2014 | - BRUSH NEW | | | Gunglemente | | |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| | 1 | 50 | | \$18.13 | \$7.85 | \$0.00 | \$0.00 | \$25.98 | |
| | 2 | 55 | | \$19.94 | \$7.85 | \$3.66 | \$0.00 | \$31.45 | |
| | 3 | 60 | | \$21.76 | \$7.85 | \$3.99 | \$0.00 | \$33.60 | |
| | 4 | 65 | | \$23.57 | \$7.85 | \$4.32 | \$0.00 | \$35.74 | |
| | 5 | 70 | | \$25.38 | \$7.85 | \$14.11 | \$0.00 | \$47.34 | |
| | 6 | 75 | | \$27.20 | \$7.85 | \$14.44 | \$0.00 | \$49.49 | |
| | 7 | 80 | | \$29.01 | \$7.85 | \$14.77 | \$0.00 | \$51.63 | |
| | 8 | 90 | | \$32.63 | \$7.85 | \$15.44 | \$0.00 | \$55.92 | |
| | | | | | | | | | |
| | Effecti | ive Date - | 01/01/2015 | | 11 14 | D I | Supplemental | T (1 D (| |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | 1 otal Rate | |
| | 1 | 50 | | \$18.58 | \$7.85 | \$0.00 | \$0.00 | \$26.43 | |
| | 2 | 55 | | \$20.44 | \$7.85 | \$3.66 | \$0.00 | \$31.95 | |
| | 3 | 60 | | \$22.30 | \$7.85 | \$3.99 | \$0.00 | \$34.14 | |
| | 4 | 65 | | \$24.15 | \$7.85 | \$4.32 | \$0.00 | \$36.32 | |
| | 5 | 70 | | \$26.01 | \$7.85 | \$14.11 | \$0.00 | \$47.97 | |
| | 6 | 75 | | \$27.87 | \$7.85 | \$14.44 | \$0.00 | \$50.16 | |
| | 7 | 80 | | \$29.73 | \$7.85 | \$14.77 | \$0.00 | \$52.35 | |
| | 8 | 90 | | \$33.44 | \$7.85 | \$15.44 | \$0.00 | \$56.73 | |
| | Notes: | | | | | | | | |
| | 1 | Steps are | 750 hrs. | | | | | | |
| | Annre | ntice to Io | urnerworker Patio:1:1 | | | | | | |
| DAINTED / TA | DED (D | DIISU DEI | DAINTY | | | | 01/10 | <u> </u> | |
| PAINTERS LOCAL | 35 - ZON | E 2 | (AINT) | 07/01/2014 | \$34.32 | \$7.85 | \$16.10 | \$0.00 | \$58.27 |
| | | | | 01/01/2013 | \$35.22 | \$7.85 | \$16.10 | 50.00 | \$39.17 |
| | | | | 07/01/2015 | \$30.12 | \$ 7.85 | \$16.10 | \$0.00 | \$00.07 |
| | | | | 01/01/2010 | \$37.07 | \$7.83 | \$16.10 | \$0.00 | \$61.02 |
| | | | | 01/01/2013 | \$38.02 | \$7.85 | \$16.10 | \$0.00 | \$62.92 |

| Classification | | | | Effective Da | te Base Wag | e Health | Pension | Supplemental Unemployment | Total Rate |
|---------------------------------|-------------------|--------------------------|----------------------------|----------------------|-------------|----------|--------------|------------------------------|------------|
| | Appren | tice - PA | AINTER Local 35 Zone 2 - B | RUSH REPAINT | | | | | |
| | Effectiv | ve Date - | 07/01/2014 | | | | Supplemental | | |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| | 1 | 50 | | \$17.16 | \$7.85 | \$0.00 | \$0.00 | \$25.01 | |
| | 2 | 55 | | \$18.88 | \$7.85 | \$3.66 | \$0.00 | \$30.39 | |
| | 3 | 60 | | \$20.59 | \$7.85 | \$3.99 | \$0.00 | \$32.43 | |
| | 4 | 65 | | \$22.31 | \$7.85 | \$4.32 | \$0.00 | \$34.48 | |
| | 5 | 70 | | \$24.02 | \$7.85 | \$14.11 | \$0.00 | \$45.98 | |
| | 6 | 75 | | \$25.74 | \$7.85 | \$14.44 | \$0.00 | \$48.03 | |
| | 7 | 80 | | \$27.46 | \$7.85 | \$14.77 | \$0.00 | \$50.08 | |
| | 8 | 90 | | \$30.89 | \$7.85 | \$15.44 | \$0.00 | \$54.18 | |
| | Effectiv | ve Date - | 01/01/2015 | | | | Supplemental | | |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | : |
| | 1 | 50 | | \$17.61 | \$7.85 | \$0.00 | \$0.00 | \$25.46 | |
| | 2 | 55 | | \$19.37 | \$7.85 | \$3.66 | \$0.00 | \$30.88 | |
| | 3 | 60 | | \$21.13 | \$7.85 | \$3.99 | \$0.00 | \$32.97 | |
| | 4 | 65 | | \$22.89 | \$7.85 | \$4.32 | \$0.00 | \$35.06 | |
| | 5 | 70 | | \$24.65 | \$7.85 | \$14.11 | \$0.00 | \$46.61 | |
| | 6 | 75 | | \$26.42 | \$7.85 | \$14.44 | \$0.00 | \$48.71 | |
| | 7 | 80 | | \$28.18 | \$7.85 | \$14.77 | \$0.00 | \$50.80 | |
| | 8 | 90 | | \$31.70 | \$7.85 | \$15.44 | \$0.00 | \$54.99 | |
| | Notes: | | | | | | | | |
| | i | Steps are | 750 hrs. | | | | | | |
| | Apprei | tice to Jo | urneyworker Ratio:1:1 | | | | | | |
| PANEL & PICH TEAMSTERS JOINT | KUP TRU COUNCI | JCKS DR 1. NO. 10 ZO. | IVER NE B | 12/01/2012 | \$30.28 | \$9.07 | \$8.00 | \$0.00 | \$47.35 |
| PIER AND DO DECK) | CK CON | ISTRUCT | OR (UNDERPINNING AN | D 09/01/2013 | \$ \$37.01 | \$9.80 | \$18.17 | \$0.00 | \$64.98 |
| PILE DRIVER LOC | AL 30 (20. | NE 2) | | 09/01/2013 | \$ \$37.01 | \$9.80 | \$18.17 | \$0.00 | \$64.98 |
| PILE DRIVER LOC | AL 56 (ZO. | NE 2) | | | | | | | |
| | | | | | | | | | |
| | Appres | tice - PI | LE DRIVER - Local 56 Zone | 2 | | | | | |
| | Effectiv | ve Date - | 09/01/2013 | | | | Supplemental | | |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |

| | Step | percent | Apprentice I | Base Wage | Health | Pension | Unemployment | Total Rate | | | |
|-------------|---------------------------------------|--|--------------------------------------|--------------------------|---------|---------|--------------|------------|----------|--|--|
| | 1 | 0 | 5 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | \$0.00 | | | |
| | Notes: | Apprentice wages sha (Same as set in Zone 1\$49.52/2\$53.83/3\$5 | 1) 8.14/4\$60.30/5\$62.45/6\$62.4 | g Steps; 5/7\$66.76/8 | \$66.76 | | | | | | |
| | Apprentice to Journeyworker Ratio:1:3 | | | | | | | | | | |
| Issue Date: | 11/03/20 | 14 | Wage Request Number: | 201411 | 03-008 | | | Page | 27 of 39 | | |

Supplemental

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|--------|---------|------------------------------|------------|
| PIPELAYER | 06/01/2014 | \$30.60 | \$7.30 | \$12.10 | \$0.00 | \$50.00 |
| LABORERS - ZONE 2 | 12/01/2014 | \$31.10 | \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| | 06/01/2015 | \$31.60 | \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | 12/01/2015 | \$32.10 | \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | 06/01/2016 | \$32.60 | \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | 12/01/2016 | \$33.35 | \$7.30 | \$12.10 | \$0.00 | \$52.75 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| PLUMBER & PIPEFITTER | 09/01/2014 | \$41.11 | \$9.35 | \$14.26 | \$0.00 | \$64.72 |
| PLUMBERS LOCAL 4 | 09/01/2015 | \$41.71 | \$9.35 | \$14.26 | \$0.00 | \$65.32 |
| | 03/01/2016 | \$42.36 | \$9.35 | \$14.26 | \$0.00 | \$65.97 |
| | 09/01/2016 | \$42.96 | \$9.35 | \$14.26 | \$0.00 | \$66.57 |
| | 03/01/2017 | \$43.61 | \$9.35 | \$14.26 | \$0.00 | \$67.22 |
| | 09/01/2017 | \$44.21 | \$9.35 | \$14.26 | \$0.00 | \$67.82 |
| | 03/01/2018 | \$44.86 | \$9.35 | \$14.26 | \$0.00 | \$68.47 |

Apprentice - PLUMBER/PIPEFITTER - Local 4 Effective Date ____09/01/2014

| Effect | We Date - 00/01/2014 | | | | Supplemental | | |
|--------|----------------------|----------------------|--------|---------|--------------|------------|--|
| Step | percent | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| 1 | 40 | \$16.44 | \$9.35 | \$0.00 | \$0.00 | \$25.79 | |
| 2 | 50 | \$20.56 | \$9.35 | \$0.00 | \$0.00 | \$29.91 | |
| 3 | 60 | \$24.67 | \$9.35 | \$0.00 | \$0.00 | \$34.02 | |
| 4 | 70 | \$28.78 | \$9.35 | \$4.55 | \$0.00 | \$42.68 | |
| 5 | 80 | \$32.89 | \$9.35 | \$4.55 | \$0.00 | \$46.79 | |
| | | | | | | | |

| Effective Date - 09/01/2012 | Effective Dat | e - 09/01/2015 | |
|-----------------------------|---------------|----------------|--|
|-----------------------------|---------------|----------------|--|

| Step | percent | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
|------|---------|----------------------|--------|---------|--------------|------------|--|
| 1 | 40 | \$16.68 | \$9.35 | \$0.00 | \$0.00 | \$26.03 | |
| 2 | 50 | \$20.86 | \$9.35 | \$0.00 | \$0.00 | \$30.21 | |
| 3 | 60 | \$25.03 | \$9.35 | \$0.00 | \$0.00 | \$34.38 | |
| 4 | 70 | \$29.20 | \$9.35 | \$4.55 | \$0.00 | \$43.10 | |
| 5 | 80 | \$33.37 | \$9.35 | \$4.55 | \$0.00 | \$47.27 | |
| | | | | | | | |

Notes:

Steps - 2000 hrs;Step 4 w/license-75;Step 5 w/license-85

Step 4 with lic\$44.73 Step 5 with lic\$48.84

Apprentice to Journeyworker Ratio:1:3

| PNEUMATIC CONTROLS (TEMP.) | 09/01/2014 | \$41.11 | \$9.35 | \$14.26 | \$0.00 | \$64.72 |
|--|------------|---------|--------|---------|--------|---------|
| PLUMBERS LOCAL 4 | 09/01/2015 | \$41.71 | \$9.35 | \$14.26 | \$0.00 | \$65.32 |
| | 03/01/2016 | \$42.36 | \$9.35 | \$14.26 | \$0.00 | \$65.97 |
| | 09/01/2016 | \$42.96 | \$9.35 | \$14.26 | \$0.00 | \$66.57 |
| | 03/01/2017 | \$43.61 | \$9.35 | \$14.26 | \$0.00 | \$67.22 |
| | 09/01/2017 | \$44.21 | \$9.35 | \$14.26 | \$0.00 | \$67.82 |
| | 03/01/2018 | \$44.86 | \$9.35 | \$14.26 | \$0.00 | \$68.47 |
| AND A REAL AND | | | | | | |

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

Issue Date: 11/03/2014 Wage Request Number: 20141103-008

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|------------|
| PNEUMATIC DRILL/TOOL OPERATOR | 06/01/2014 | \$30.60 | \$7.30 | \$12.10 | \$0.00 | \$50.00 |
| LABORERS - ZONE 2 | 12/01/2014 | \$31.10 | \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| | 06/01/2015 | \$31.60 | \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | 12/01/2015 | \$32.10 | \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | 06/01/2016 | \$32.60 | \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | 12/01/2016 | \$33.35 | \$7.30 | \$12.10 | \$0.00 | \$52.75 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| POWDERMAN & BLASTER | 06/01/2014 | \$31.35 | \$7.30 | \$12.10 | \$0.00 | \$50.75 |
| Indonaia - 2018 2 | 12/01/2014 | \$31.85 | \$7.30 | \$12.10 | \$0.00 | \$51.25 |
| | 06/01/2015 | \$32.35 | \$7.30 | \$12.10 | \$0.00 | \$51.75 |
| | 12/01/2015 | \$32.85 | \$7.30 | \$12.10 | \$0.00 | \$52.25 |
| | 06/01/2016 | \$33.35 | \$7.30 | \$12.10 | \$0.00 | \$52.75 |
| | 12/01/2016 | \$34.10 | \$7.30 | \$12.10 | \$0.00 | \$53.50 |
| For apprentice rates see "Apprentice- LABORER" | | | | 014.00 | 00.00 | |
| OPERATING ENGINEERS LOCAL 4 | 06/01/2014 | \$41.49 | \$10.00 | \$14.20 | \$0.00 | \$65.69 |
| | 12/01/2014 | \$42.49 | \$10.00 | \$14.20 | \$0.00 | \$66.69 |
| | 06/01/2015 | \$43.24 | \$10.00 | \$14.20 | \$0.00 | \$67.44 |
| | 12/01/2015 | \$44.49 | \$10.00 | \$14.20 | \$0.00 | \$68.69 |
| | 06/01/2016 | \$45.24 | \$10.00 | \$14.20 | \$0.00 | \$69.44 |
| | 12/01/2016 | \$46.49 | \$10.00 | \$14.20 | \$0.00 | \$70.69 |
| | 06/01/2017 | \$47.49 | \$10.00 | \$14.20 | \$0.00 | \$71.69 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | 12/01/2017 | \$48.49 | \$10.00 | \$14.20 | \$0.00 | \$72.69 |
| PUMP OPERATOR (CONCRETE) | 06/01/2014 | \$41.49 | \$10.00 | \$14.20 | \$0.00 | \$65.69 |
| OPERATING ENGINEERS LOCAL 4 | 12/01/2014 | \$42.49 | \$10.00 | \$14.20 | \$0.00 | \$66.69 |
| | 06/01/2015 | \$43.24 | \$10.00 | \$14.20 | \$0.00 | \$67.44 |
| | 12/01/2015 | \$44.49 | \$10.00 | \$14.20 | \$0.00 | \$68.69 |
| | 06/01/2016 | \$45.24 | \$10.00 | \$14.20 | \$0.00 | \$69.44 |
| | 12/01/2016 | \$46.49 | \$10.00 | \$14.20 | \$0.00 | \$70.69 |
| | 06/01/2017 | \$47.49 | \$10.00 | \$14.20 | \$0.00 | \$71.69 |
| | 12/01/2017 | \$48.49 | \$10.00 | \$14.20 | \$0.00 | \$72.69 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | 12/01/2017 | \$40.45 | \$10.00 | Q7 1.20 | 00.00 | \$72.05 |
| PUMP OPERATOR (DEWATERING, OTHER) | 06/01/2014 | \$28.80 | \$10.00 | \$14.20 | \$0.00 | \$53.00 |
| OPERATING ENGINEERS LOCAL 4 | 12/01/2014 | \$29.50 | \$10.00 | \$14.20 | \$0.00 | \$53.70 |
| | 06/01/2015 | \$30.02 | \$10.00 | \$14.20 | \$0.00 | \$54.22 |
| | 12/01/2015 | \$30.89 | \$10.00 | \$14.20 | \$0.00 | \$55.09 |
| | 06/01/2016 | \$31.41 | \$10.00 | \$14.20 | \$0.00 | \$55.61 |
| | 12/01/2016 | \$32.28 | \$10.00 | \$14.20 | \$0.00 | \$56.48 |
| | 06/01/2017 | \$32.97 | \$10.00 | \$14.20 | \$0.00 | \$57.17 |
| | 12/01/2017 | \$33.66 | \$10.00 | \$14.20 | \$0.00 | \$57.86 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | | | | | | |
| READY-MIX CONCRETE DRIVER TEAMSTERS LOCAL 170 | 05/01/2010 | \$22.04 | \$6.50 | \$5.44 | \$0.00 | \$33.98 |

Issue Date: 11/03/2014 Wage Request Number: 20141103-008

Page 29 of 39

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|------------|
| RECLAIMERS | 06/01/2014 | \$41.10 | \$10.00 | \$14.20 | \$0.00 | \$65.30 |
| OPERATING ENGINEERS LOCAL 4 | 12/01/2014 | \$42.09 | \$10.00 | \$14.20 | \$0.00 | \$66.29 |
| | 06/01/2015 | \$42.83 | \$10.00 | \$14.20 | \$0.00 | \$67.03 |
| | 12/01/2015 | \$44.07 | \$10.00 | \$14.20 | \$0.00 | \$68.27 |
| | 06/01/2016 | \$44.82 | \$10.00 | \$14.20 | \$0.00 | \$69.02 |
| | 12/01/2016 | \$46.05 | \$10.00 | \$14.20 | \$0.00 | \$70.25 |
| | 06/01/2017 | \$47.04 | \$10.00 | \$14.20 | \$0.00 | \$71.24 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | 12/01/2017 | \$48.03 | \$10.00 | \$14.20 | \$0.00 | \$72.23 |
| RESIDENTIAL WOOD FRAME (All Other Work) CARPENTERS - ZONE 2 (Residential Wood) | 04/01/2011 | \$24.24 | \$8.67 | \$15.51 | \$0.00 | \$48.42 |
| RESIDENTIAL WOOD FRAME CARPENTER ** ** The Residential Wood Frame Carpenter classification applies | 05/01/2011 | \$24.24 | \$6.34 | \$6.23 | \$0.00 | \$36.81 |

only to the construction of new, wood frame residences that do

not exceed four stories including the basement. CARPENTERS - ZONE

2 (Residential Wood)

As of 9/1/09 Carpentry work on wood-frame residential WEATHERIZATION projects shall be paid the RESIDENTIAL WOOD FRAME CARPENTER rate.

| Apprentice - | CARPENTER | (Residential | Wood Frame) | - Zone 2 |
|--------------|-----------|--------------|-------------|----------|
|--------------|-----------|--------------|-------------|----------|

| | Effective Date - 05/01/ | | 05/01/2011 | | | | Supplemental | | |
|-----------------|-------------------------|--------------|-----------------------|----------------------|--------|------------|--------------|------------|---------|
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | 2 |
| | 1 | 60 | | \$14.54 | \$6.34 | \$0.00 | \$0.00 | \$20.88 | 3 |
| | 2 | 60 | | \$14.54 | \$6.34 | \$6.23 | \$0.00 | \$27.11 | |
| | 3 | 65 | | \$15.76 | \$6.34 | \$6.23 | \$0.00 | \$28.33 | 3 |
| | 4 | 70 | | \$16.97 | \$6.34 | \$6.23 | \$0.00 | \$29.54 | |
| | 5 | 75 | | \$18.18 | \$6.34 | \$6.23 | \$0.00 | \$30.75 | 5 |
| | 6 | 80 | | \$19.39 | \$6.34 | \$6.23 | \$0.00 | \$31.96 | i. |
| | 7 | 85 | | \$20.60 | \$6.34 | \$6.23 | \$0.00 | \$33.17 | 7 |
| | 8 | 90 | | \$21.82 | \$6.34 | \$6.23 | \$0.00 | \$34.39 | 2 |
| | Notes: | | | | | | | | |
| | | | | | | | | | |
| | Appre | ntice to Joi | urneyworker Ratio:1:5 | | | | | | |
| RIDE-ON MOT | ORIZE | D BUGGY | OPERATOR | 06/01/2014 | \$30 | .60 \$7.30 | \$12.10 | \$0.00 | \$50.00 |
| LABORERS - ZONE | 2 | | | 12/01/2014 | \$31 | .10 \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| | | | | 06/01/2015 | \$31 | .60 \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | | | | 12/01/2015 | \$32 | .10 \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | | | | 06/01/2016 | \$32 | .60 \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | | | | 12/01/2016 | \$33 | .35 \$7.30 | \$12.10 | \$0.00 | \$52.75 |

For apprentice rates see "Apprentice- LABORER"

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|------------|
| ROLLER/SPREADER/MULCHING MACHINE | 06/01/2014 | \$41.10 | \$10.00 | \$14.20 | \$0.00 | \$65.30 |
| OPERATING ENGINEERS LOCAL 4 | 12/01/2014 | \$42.09 | \$10.00 | \$14.20 | \$0.00 | \$66.29 |
| | 06/01/2015 | \$42.83 | \$10.00 | \$14.20 | \$0.00 | \$67.03 |
| | 12/01/2015 | \$44.07 | \$10.00 | \$14.20 | \$0.00 | \$68.27 |
| | 06/01/2016 | \$44.82 | \$10.00 | \$14.20 | \$0.00 | \$69.02 |
| | 12/01/2016 | \$46.05 | \$10.00 | \$14.20 | \$0.00 | \$70.25 |
| | 06/01/2017 | \$47.04 | \$10.00 | \$14.20 | \$0.00 | \$71.24 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | 12/01/2017 | \$48.03 | \$10.00 | \$14.20 | \$0.00 | \$72.23 |
| ROOFER (Inc. Roofer Waterproofing & Roofer Damproofg) | 08/01/2014 | \$39.21 | \$10.50 | \$11.60 | \$0.00 | \$61.31 |
| ROOFERS LOCAL 33 | 02/01/2015 | \$40.11 | \$10.50 | \$11.60 | \$0.00 | \$62.21 |
| | 08/01/2015 | \$41.01 | \$10.50 | \$11.60 | \$0.00 | \$63.11 |
| | 02/01/2016 | \$41.91 | \$10.50 | \$11.60 | \$0.00 | \$64.01 |

| | Appre | ntice - RC | OOFER - Local 33 | | | | | | |
|---------------|----------------|----------------------------|---|-----------------------|-----------|---------|------------------------------|------------|---------------|
| | Step | percent | 08/01/2014 | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate | 3 |
| | 1 | 50 | | \$19.61 | \$10.50 | \$3.38 | \$0.00 | \$33.49 | > |
| | 2 | 60 | | \$23.53 | \$10.50 | \$11.60 | \$0.00 | \$45.63 | 3 |
| | 3 | 65 | | \$25.49 | \$10.50 | \$11.60 | \$0.00 | \$47.59 |) |
| | 4 | 75 | | \$29.41 | \$10.50 | \$11.60 | \$0.00 | \$51.51 | ť. |
| | 5 | 85 | | \$33.33 | \$10.50 | \$11.60 | \$0.00 | \$55.43 | ł |
| | Effecti | ive Date - | 02/01/2015 | | | | Supplemental | | |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | > |
| | 1 | 50 | | \$20.06 | \$10.50 | \$3.38 | \$0.00 | \$33.94 | í. |
| | 2 | 60 | | \$24.07 | \$10.50 | \$11.60 | \$0.00 | \$46.17 | I. |
| | 3 | 65 | | \$26.07 | \$10.50 | \$11.60 | \$0.00 | \$48.17 | 7 |
| | 4 | 75 | | \$30.08 | \$10.50 | \$11.60 | \$0.00 | \$52.18 | 3 |
| | 5 | 85 | | \$34.09 | \$10.50 | \$11.60 | \$0.00 | \$56.19 |) |
| | Notes: | ** 1:5, 2:6 Step 1 is 2 | 5-10, the 1:10; Reroofing: 1:4 2000 hrs.; Steps 2-5 are 1000 | 4, then 1:1) hrs. | | | | | |
| | Appre | ntice to Jo | urneyworker Ratio: ** | | | | | | |
| ROOFER SLA | ATE / TIL | E / PRECA | AST CONCRETE | 08/01/201 | 4 \$39.46 | \$10.50 | \$11.60 | \$0.00 | \$61.56 |
| ROUPERS LOCA. | 2 22 | | | 02/01/201 | 5 \$40.36 | \$10.50 | \$11.60 | \$0.00 | \$62.46 |
| | | | | 08/01/201 | 5 \$41.26 | \$10.50 | \$11.60 | \$0.00 | \$63.36 |
| | | | | 02/01/2010 | \$42.16 | \$10.50 | \$11.60 | \$0.00 | \$64.26 |
| For apprentic | ce rates see ' | 'Apprentice- F | ROOFER" | | | | 10.000 | | |
| SHEET METAL W | ORKERS LO | CAL 63 | | 07/01/201 | 4 \$32.32 | \$8.64 | \$14.20 | \$1.66 | \$56.82 |
| | | | | 01/01/201 | 5 \$32.97 | \$8.64 | \$14.20 | \$1.66 | \$57.47 |
| | | | | 07/01/201: | 5 \$33.03 | \$8.64 | \$14.79 | \$1.66 | \$58.12 |
| | | | | 01/01/201 | 5 \$33.73 | \$8.64 | \$14.79 | \$1.66 | \$58.82 |
| | | | | 07/01/201 | \$34.44 | \$8.64 | \$14.83 | \$1.66 | \$59.57 |
| | | | | 01/01/201 | \$35.19 | \$8.64 | \$14.83 | \$1.66 | \$60.32 |
| Issue Date: | 11/03/20 | 14 | Wage Reque | st Number: 201411 | 03-008 | | |] | Page 31 of 39 |

Supplemental

Unemployment

Total Rate

| Step | percent | Apprentice Base Wag | ge Health | Pension | Supplemental Unemployment | Total Rat |
|--|--|---|--|---|--|--|
| 1 | 45 | \$14.54 | \$5.65 | \$3.81 | \$0.00 | \$24.0 |
| 2 | 50 | \$16.16 | \$5.93 | \$4.24 | \$0.00 | \$26.3 |
| 3 | 55 | \$17.78 | \$6.20 | \$7.62 | \$0.95 | \$32.5 |
| 4 | 60 | \$19.39 | \$6.47 | \$7.62 | \$1.00 | \$34.4 |
| 5 | 65 | \$21.01 | \$6.74 | \$7.62 | \$1.06 | \$36.4 |
| 6 | 70 | \$22.62 | \$7.01 | \$7.62 | \$1.12 | \$38.3 |
| 7 | 75 | \$24.24 | \$7.28 | \$7.62 | \$1.17 | \$40.3 |
| 8 | 80 | \$25.86 | \$7.55 | \$13.35 | \$1.40 | \$48.1 |
| 9 | 85 | \$27.47 | \$7.83 | \$13.35 | \$1.46 | \$50.1 |
| 10 | 90 | \$29.09 | \$8.10 | \$13.35 | \$1.52 | \$52.0 |
| Effect | ive Date - 01/01/ | /2015 | | | Supplemental | |
| Step | percent | Apprentice Base Wag | ge Health | Pension | Unemployment | Total Rat |
| 1 | 45 | \$14.84 | \$5.65 | \$3.81 | \$0.00 | \$24.3 |
| | | | \$5.02 | \$4.24 | \$0.00 | 0000 |
| 2 | 50 | \$16.49 | \$3.95 | | \$0.00 | \$20.0 |
| 2 3 | 50 55 | \$16.49 \$18.13 | \$6.20 | \$7.62 | \$0.95 | \$26.6 |
| 2 3 4 | 50 55 60 | \$16.49 \$18.13 \$19.78 | \$6.20 \$6.47 | \$7.62 \$7.62 | \$0.95 \$1.00 | \$26.6 \$32.9 \$34.8 |
| 2 3 4 5 | 50 55 60 65 | \$16.49 \$18.13 \$19.78 \$21.43 | \$6.20 \$6.47 \$6.74 | \$7.62 \$7.62 \$7.62 | \$0.95 \$1.00 \$1.06 | \$26.6 \$32.9 \$34.8 \$36.8 |
| 2 3 4 5 6 | 50 55 60 65 70 | \$16.49 \$18.13 \$19.78 \$21.43 \$23.08 | \$6.20 \$6.47 \$6.74 \$7.01 | \$7.62 \$7.62 \$7.62 \$7.62 | \$0.95 \$1.00 \$1.06 \$1.12 | \$26.6 \$32.9 \$34.8 \$36.8 \$38.8 |
| 2 3 4 5 6 7 | 50 55 60 65 70 75 | \$16.49 \$18.13 \$19.78 \$21.43 \$23.08 \$24.73 | \$3.93 \$6.20 \$6.47 \$6.74 \$7.01 \$7.28 | \$7.62 \$7.62 \$7.62 \$7.62 \$7.62 \$7.62 | \$0.00 \$0.95 \$1.00 \$1.06 \$1.12 \$1.17 | \$26.6 \$32.9 \$34.8 \$36.8 \$38.8 \$38.8 \$40.8 |
| 2 3 4 5 6 7 8 | 50 55 60 65 70 75 80 | \$16.49 \$18.13 \$19.78 \$21.43 \$23.08 \$24.73 \$26.38 | \$3.93 \$6.20 \$6.47 \$6.74 \$7.01 \$7.28 \$7.55 | \$7.62 \$7.62 \$7.62 \$7.62 \$7.62 \$7.62 \$13.35 | \$0.00 \$0.95 \$1.00 \$1.06 \$1.12 \$1.17 \$1.40 | \$26.6 \$32.9 \$34.8 \$36.8 \$38.8 \$40.8 \$48.6 |
| 2 3 4 5 6 7 8 9 | 50 55 60 65 70 75 80 85 | \$16.49 \$18.13 \$19.78 \$21.43 \$23.08 \$24.73 \$26.38 \$28.02 | \$5.35 \$6.20 \$6.47 \$7.01 \$7.28 \$7.55 \$7.83 | \$7.62 \$7.62 \$7.62 \$7.62 \$7.62 \$7.62 \$13.35 \$13.35 | \$0.00 \$0.95 \$1.00 \$1.06 \$1.12 \$1.17 \$1.40 \$1.46 | \$26.c \$32.5 \$34.8 \$36.8 \$38.8 \$48.6 \$48.6 \$50.6 |
| 2 3 4 5 6 7 8 9 10 | 50 55 60 65 70 75 80 85 90 | \$16.49 \$18.13 \$19.78 \$21.43 \$23.08 \$24.73 \$26.38 \$28.02 \$29.67 | \$6.20 \$6.47 \$6.74 \$7.01 \$7.28 \$7.55 \$7.83 \$8.10 | \$7.62 \$7.62 \$7.62 \$7.62 \$7.62 \$13.35 \$13.35 \$13.35 | \$0.00 \$0.95 \$1.00 \$1.06 \$1.12 \$1.17 \$1.40 \$1.46 \$1.52 | \$26.0 \$32.9 \$34.8 \$36.8 \$38.8 \$40.8 \$40.8 \$44.6 \$50.6 \$52.6 |
| 2 3 4 5 6 7 8 9 10 Notes | 50 55 60 65 70 75 80 85 90 | \$16.49 \$18.13 \$19.78 \$21.43 \$23.08 \$24.73 \$26.38 \$28.02 \$29.67 | \$5.35 \$6.20 \$6.47 \$7.01 \$7.28 \$7.55 \$7.83 \$8.10 | \$7.62 \$7.62 \$7.62 \$7.62 \$7.62 \$13.35 \$13.35 \$13.35 | \$0.00 \$0.95 \$1.00 \$1.06 \$1.12 \$1.17 \$1.40 \$1.46 \$1.52 | \$26.0 \$32.9 \$34.8 \$36.8 \$38.8 \$40.8 \$48.6 \$50.6 \$52.6 |

Effective Date Base Wage Health Pension

Classification

| Classification | | | Effect | ive Date | Base Wage | e Health | Pension | Supplemental Unemployment | Total Rate |
|------------------|---------------------------|---|-----------------------------|----------|-----------|----------|-----------------------------|------------------------------|------------|
| | Apprer Effecti Step | ntice - SIGN ERECTOR - Local 35 ve Date - 06/01/2013 | Zone 2 Apprentice Base V | Wage 1 | Health | Pension | Supplementa Unemployment | 1 t Total Rate | |
| | 1 | 50 | \$12.01 | indge i | \$7.07 | \$0.00 | \$0.00 | \$10.08 | |
| | 2 | 55 | \$14.20 | | \$7.07 | \$2.45 | \$0.00 | \$23.70 | |
| | 3 | 60 | \$15.49 | | \$7.07 | \$2.45 | \$0.00 | \$25.72 | |
| | 4 | 65 | \$16.78 | | \$7.07 | \$2.45 | \$0.00 | \$25.01 | |
| | 5 | 70 | \$18.07 | | \$7.07 | \$7.05 | \$0.00 | \$20.50 \$32.10 | |
| | 6 | 75 | \$19.36 | | \$7.07 | \$7.05 | \$0.00 | \$33.48 | |
| | 7 | 80 | \$19.55 | | \$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: | | | | | | | | |
| | I | Steps are 4 mos. | | | | | | | |
| | Appre | ntice to Journeyworker Ratio:1:1 | | | | | | | |
| SPECIALIZED | EARTH | I MOVING EQUIP < 35 TONS | 08/0 | 1/2014 | \$31.59 | \$9.91 | \$8.80 | \$0.00 | \$50.30 |
| TEAMSTERS JOINT | T COUNCI | IL NO. 10 ZONE B | 12/0 | 1/2014 | \$31.59 | \$9.91 | \$9.33 | \$0.00 | \$50.83 |
| | | | 06/0 | 1/2015 | \$31.94 | \$9.91 | \$9.33 | \$0.00 | \$51.18 |
| | | | 08/0 | 1/2015 | \$31.94 | \$10.41 | \$9.33 | \$0.00 | \$51.68 |
| | | | 12/0 | 1/2015 | \$31.94 | \$10.41 | \$10.08 | \$0.00 | \$52.43 |
| | | | 06/0 | 1/2016 | \$32.44 | \$10.41 | \$10.08 | \$0.00 | \$52.93 |
| | | | 08/0 | 1/2016 | \$32.44 | \$10.91 | \$10.08 | \$0.00 | \$53.43 |
| | | | 12/0 | 1/2016 | \$32.44 | \$10.91 | \$10.89 | \$0.00 | \$54.24 |
| SPECIALIZED | EARTH | I MOVING EQUIP > 35 TONS | 08/0 | 1/2014 | \$31.88 | \$9.91 | \$8.80 | \$0.00 | \$50.59 |
| TEAMSTERS JOINI | r COUNCI | L NO. 10 ZONE B | 12/0 | 1/2014 | \$31.88 | \$9.91 | \$9.33 | \$0.00 | \$51.12 |
| | | | 06/0 | 1/2015 | \$32.23 | \$9.91 | \$9.33 | \$0.00 | \$51.47 |
| | | | 08/0 | 1/2015 | \$32.23 | \$10.41 | \$9.33 | \$0.00 | \$51.97 |
| | | | 12/0 | 1/2015 | \$32.23 | \$10.41 | \$10.08 | \$0.00 | \$52.72 |
| | | | 06/0 | 1/2016 | \$32.73 | \$10.41 | \$10.08 | \$0.00 | \$53.22 |
| | | | 08/0 | 1/2016 | \$32.73 | \$10.91 | \$10.08 | \$0.00 | \$53.72 |
| | | | 12/0 | 1/2016 | \$32.73 | \$10.91 | \$10.89 | \$0.00 | \$54.53 |
| SPRINKLER F | ITTER | . 669 | 04/0 | 1/2014 | \$37.26 | \$8.52 | \$11.83 | \$0.00 | \$57.61 |
| ST NUMBER PH I B | Al | | 01/0 | 1/2015 | \$37.26 | \$8.52 | \$11.98 | \$0.00 | \$57.76 |
| | | | 04/0 | 1/2015 | \$38.01 | \$8.52 | \$11.98 | \$0.00 | \$58.51 |
| | | | 01/0 | 1/2016 | \$38.01 | \$8.52 | \$12.13 | \$0.00 | \$58.66 |

| Classification | | | | Effective Dat | te Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|----------------|-------------|---------------|-------------------------|----------------------|-----------------|---------|--------------|------------------------------|------------|
| | Annrei | ticeSI | PRINKLER FITTER - Local | 669 | | | | | |
| | Effecti | ve Date - | 04/01/2014 | | | | Sunnlamente | | |
| | Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| | 1 | 45 | | \$16.77 | \$7.45 | \$0.00 | \$0.00 | \$24.22 | |
| | 2 | 50 | | \$18.63 | \$7.45 | \$0.00 | \$0.00 | \$26.08 | |
| | 3 | 55 | | \$20.49 | \$8.52 | \$6.00 | \$0.00 | \$35.01 | |
| | 4 | 60 | | \$22.36 | \$8.52 | \$6.00 | \$0.00 | \$36.88 | |
| | 5 | 65 | | \$24.22 | \$8.52 | \$6.25 | \$0.00 | \$38.99 | |
| | 6 | 70 | | \$26.08 | \$8.52 | \$6.25 | \$0.00 | \$40.85 | |
| | 7 | 75 | | \$27.95 | \$8.52 | \$6.25 | \$0.00 | \$42.72 | |
| | 8 | 80 | | \$29.81 | \$8.52 | \$6.25 | \$0.00 | \$44.58 | |
| | 9 | 85 | | \$31.67 | \$8.52 | \$6.25 | \$0.00 | \$46.44 | |
| | 10 | 90 | | \$33.53 | \$8.52 | \$6.25 | \$0.00 | \$48.30 | |
| | | | | | | | | | |
| | Effecti | ve Date - | 01/01/2015 | Apprentice Rese Wage | Health | Paneion | Supplementa | Total Pata | |
| | 1 | 45 | | Rife 77 | 67.45 | £0.00 | en or | . 10tal Rate | |
| | 2 | 45 | | \$10.77 | \$7.45 | \$0.00 | \$0.00 | \$24.22 | |
| | 3 | 55 | | \$18.03 | \$7.45 | \$0.00 | \$0.00 | \$20.08 | |
| | 4 | 55 60 | | \$20.49 | \$8.52 | \$0.15 | \$0.00 | \$35.10 | |
| | 5 | 65 | | \$22.30 | \$8.52 | \$0.15 | \$0.00 | \$37.03 | |
| | 6 | 70 | | \$24.22 | \$8.52 69.50 | \$0.40 | \$0.00 | \$39.14 | |
| | 7 | 70 | | \$26.08 | \$8.52 | \$0.40 | \$0.00 | \$41.00 | |
| | 8 | 20 | | \$27.95 | \$8.52 | \$6.40 | \$0.00 | \$42.87 | |
| | 0 | 85 | | \$29.81 | \$8.52 | \$0.40 | \$0.00 | \$44.73 | |
| | 10 | 00 | | \$31.07 | \$8.52 69.50 | \$0.40 | \$0.00 | \$40.59 | |
| | 10 | 90 | | \$33.33 | \$8.52 | \$0.40 | \$0.00 | \$48.45 | |
| | Notes: | | | | | | | | |
| | Appres | ntice to Jo | urneyworker Ratio:1:1 | | | | | | |
| STEAM BOILE | ROPER | RATOR | | 06/01/2014 | \$41.10 | \$10.00 | \$14.20 | \$0.00 | \$65.30 |
| OPERALING ENGL | VBBRO LC | NUAL 4 | | 12/01/2014 | \$42.09 | \$10.00 | \$14.20 | \$0.00 | \$66.29 |
| | | | | 06/01/2015 | \$42.83 | \$10.00 | \$14.20 | \$0.00 | \$67.03 |
| | | | | 12/01/2015 | \$44.07 | \$10.00 | \$14.20 | \$0.00 | \$68.27 |
| | | | | 06/01/2016 | \$44.82 | \$10.00 | \$14.20 | \$0.00 | \$69.02 |
| | | | | 12/01/2016 | \$46.05 | \$10.00 | \$14.20 | \$0.00 | \$70.25 |
| | | | | 06/01/2017 | \$47.04 | \$10.00 | \$14.20 | \$0.00 | \$71.24 |
| For apprentice | rates see " | Apprentice- (| OPERATING ENGINEERS" | 12/01/2017 | \$48.03 | \$10.00 | \$14.20 | \$0.00 | \$72.23 |

 Issue Date:
 11/03/2014
 Wage Request Number:
 20141103-008

Page 34 of 39

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|-------------------|
| TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN | 06/01/2014 | \$41.10 | \$10.00 | \$14.20 | \$0.00 | \$65.30 |
| OPERATING ENGINEERS LOCAL 4 | 12/01/2014 | \$42.09 | \$10.00 | \$14.20 | \$0.00 | \$66.29 |
| | 06/01/2015 | \$42.83 | \$10.00 | \$14.20 | \$0.00 | \$67.03 |
| | 12/01/2015 | \$44.07 | \$10.00 | \$14.20 | \$0.00 | \$68.27 |
| | 06/01/2016 | \$44.82 | \$10.00 | \$14.20 | \$0.00 | \$69.02 |
| | 12/01/2016 | \$46.05 | \$10.00 | \$14.20 | \$0.00 | \$70.25 |
| | 06/01/2017 | \$47.04 | \$10.00 | \$14.20 | \$0.00 | \$71.24 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | 12/01/2017 | \$48.03 | \$10.00 | \$14.20 | \$0.00 | \$72.23 |
| TERRAZZO FINISHERS | 08/01/2014 | \$47.90 | \$10.18 | \$18.22 | \$0.00 | \$76.30 |
| BRICKLAYERS LOCAL 3 (WORCESTER) - MARBLE & TILE | 02/01/2015 | \$48.46 | \$10.18 | \$18.22 | \$0.00 | \$76.86 |
| | 08/01/2015 | \$49.36 | \$10.18 | \$18.29 | \$0.00 | \$77.83 |
| | 02/01/2016 | \$49.93 | \$10.18 | \$18.29 | \$0.00 | \$78.40 |
| | 08/01/2016 | \$50.83 | \$10.18 | \$18.37 | \$0.00 | \$79.38 |
| | 02/01/2017 | \$51.40 | \$10.18 | \$18.37 | \$0.00 | \$79.95 |
| | | | | | | |

Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile

| Effect | ive Date - | 08/01/2014 | | | | Supplemental | | |
|--------|------------|------------|----------------------|---------|---------|--------------|------------|--|
| Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate | |
| 1 | 50 | | \$23.95 | \$10.18 | \$18.22 | \$0.00 | \$52.35 | |
| 2 | 60 | | \$28.74 | \$10.18 | \$18.22 | \$0.00 | \$57.14 | |
| 3 | 70 | | \$33.53 | \$10.18 | \$18.22 | \$0.00 | \$61.93 | |
| 4 | 80 | | \$38.32 | \$10.18 | \$18.22 | \$0.00 | \$66.72 | |
| 5 | 90 | | \$43.11 | \$10.18 | \$18.22 | \$0.00 | \$71.51 | |
| | | | | | | | | |

| Sffecti Step | ve Date - percent | 02/01/2015 | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|-----------------|----------------------|------------|----------------------|---------|---------|------------------------------|------------|
| 1 | 50 | | \$24.23 | \$10.18 | \$18.22 | \$0.00 | \$52.63 |
| 2 | 60 | | \$29.08 | \$10.18 | \$18.22 | \$0.00 | \$57.48 |
| 3 | 70 | | \$33.92 | \$10.18 | \$18.22 | \$0.00 | \$62.32 |
| 4 | 80 | | \$38.77 | \$10.18 | \$18.22 | \$0.00 | \$67.17 |
| 5 | 90 | | \$43.61 | \$10.18 | \$18.22 | \$0.00 | \$72.01 |

Apprentice to Journeyworker Ratio:1:3

| TEST BORING DRILLER | 06/01/2014 | \$35.45 | \$7.30 | \$12.90 | \$0.00 | \$55.65 |
|--|------------|---------|--------|---------|--------|---------|
| LABORERS - FOUNDATION AND MARINE | 12/01/2014 | \$36.20 | \$7.30 | \$12.90 | \$0.00 | \$56.40 |
| | 06/01/2015 | \$36.95 | \$7.30 | \$12.90 | \$0.00 | \$57.15 |
| | 12/01/2015 | \$37.70 | \$7.30 | \$12.90 | \$0.00 | \$57.90 |
| | 06/01/2016 | \$38.45 | \$7.30 | \$12.90 | \$0.00 | \$58.65 |
| | 12/01/2016 | \$39.45 | \$7.30 | \$12.90 | \$0.00 | \$59.65 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |

Issue Date: 11/03/2014

Page 35 of 39

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|------------|
| TEST BORING DRILLER HELPER | 06/01/2014 | \$34.17 | \$7.30 | \$12.90 | \$0.00 | \$54.37 |
| LABORERS - FOUNDATION AND MARINE | 12/01/2014 | \$34.92 | \$7.30 | \$12.90 | \$0.00 | \$55.12 |
| | 06/01/2015 | \$35.67 | \$7.30 | \$12.90 | \$0.00 | \$55.87 |
| | 12/01/2015 | \$36.42 | \$7.30 | \$12.90 | \$0.00 | \$56.62 |
| | 06/01/2016 | \$37.17 | \$7.30 | \$12.90 | \$0.00 | \$57.37 |
| | 12/01/2016 | \$38.17 | \$7.30 | \$12.90 | \$0.00 | \$58.37 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| IESI BORING LABORER IABORERS - FOUNDATION AND MARINE | 06/01/2014 | \$34.05 | \$7.30 | \$12.90 | \$0.00 | \$54.25 |
| | 12/01/2014 | \$34.80 | \$7.30 | \$12.90 | \$0.00 | \$55.00 |
| | 06/01/2015 | \$35.55 | \$7.30 | \$12.90 | \$0.00 | \$55.75 |
| | 12/01/2015 | \$36.30 | \$7.30 | \$12.90 | \$0.00 | \$56.50 |
| | 06/01/2016 | \$37.05 | \$7.30 | \$12.90 | \$0.00 | \$57.25 |
| For apprentice rates see "Apprentice- LABORER" | 12/01/2016 | \$38.05 | \$7.30 | \$12.90 | \$0.00 | \$58.25 |
| TRACTORS/PORTABLE STEAM GENERATORS | 06/01/2014 | \$41.10 | \$10.00 | \$14.20 | \$0.00 | \$65.30 |
| OPERATING ENGINEERS LOCAL 4 | 12/01/2014 | \$42.09 | \$10.00 | \$14.20 | \$0.00 | \$66.29 |
| | 06/01/2015 | \$42.83 | \$10.00 | \$14.20 | \$0.00 | \$67.03 |
| | 12/01/2015 | \$44.07 | \$10.00 | \$14.20 | \$0.00 | \$68.27 |
| | 06/01/2016 | \$44.82 | \$10.00 | \$14.20 | \$0.00 | \$69.02 |
| | 12/01/2016 | \$46.05 | \$10.00 | \$14.20 | \$0.00 | \$70.25 |
| | 06/01/2017 | \$47.04 | \$10.00 | \$14.20 | \$0.00 | \$71.24 |
| | 12/01/2017 | \$48.03 | \$10.00 | \$14.20 | \$0.00 | \$72.23 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | | 4.000 | ÷ | | | 1 |
| TRAILERS FOR EARTH MOVING EQUIPMENT | 08/01/2014 | \$32.17 | \$9.91 | \$8.80 | \$0.00 | \$50.88 |
| TEAMSTERS JOINT COUNCIL NO. 10 ZONE B | 12/01/2014 | \$32.17 | \$9.91 | \$9.33 | \$0.00 | \$51.41 |
| | 06/01/2015 | \$32.52 | \$9.91 | \$9.33 | \$0.00 | \$51.76 |
| | 08/01/2015 | \$32.52 | \$10.41 | \$9.33 | \$0.00 | \$52.26 |
| | 12/01/2015 | \$32.52 | \$10.41 | \$10.08 | \$0.00 | \$53.01 |
| | 06/01/2016 | \$33.02 | \$10.41 | \$10.08 | \$0.00 | \$53.51 |
| | 08/01/2016 | \$33.02 | \$10.91 | \$10.08 | \$0.00 | \$54.01 |
| | 12/01/2016 | \$33.02 | \$10.91 | \$10.89 | \$0.00 | \$54.82 |
| TUNNEL WORK - COMPRESSED AIR | 06/01/2014 | \$46.33 | \$7.30 | \$13.30 | \$0.00 | \$66.93 |
| and the contract and | 12/01/2014 | \$47.08 | \$7.30 | \$13.30 | \$0.00 | \$67.68 |
| | 06/01/2015 | \$47.83 | \$7.30 | \$13.30 | \$0.00 | \$68.43 |
| | 12/01/2015 | \$48.58 | \$7.30 | \$13.30 | \$0.00 | \$69.18 |
| | 06/01/2016 | \$49.33 | \$7.30 | \$13.30 | \$0.00 | \$69.93 |
| For apprentice rates see "Apprentice. I ABODED" | 12/01/2016 | \$50.33 | \$7.30 | \$13.30 | \$0.00 | \$70.93 |
| TUNNEL WORK - COMPRESSED AIR (HAZ WASTE) | 0.01/0014 | 6 40 00 | 67.00 | \$12.20 | \$0.00 | 0/0.02 |
| LABORERS (COMPRESSED AIR) | 06/01/2014 | \$48.33 | \$7.30 | \$13.30 | \$0.00 | \$68.93 |
| | 12/01/2014 | \$49.08 | \$7.30 | \$13.30 | \$0.00 | \$09.08 |
| | 12/01/2015 | \$49.85 | \$7.30 | \$13.30 | \$0.00 | \$70.45 |
| | 06/01/2015 | \$51.33 | \$7.30 | \$13.30 | \$0.00 | \$/1.18 |
| | 12/01/2016 | \$52.22 | \$7.30 | \$13.30 | \$0.00 | \$72.02 |
| For apprentice rates see "Apprentice- LABORER" | 12/01/2010 | \$32.33 | \$7.50 | φ13.30 | φυ.υυ | \$12.93 |
| | | | | | | |
| | | | | | | |

Issue Date: 11/03/2014 Wage Request Number: 20141103-008 Page 36 of 39

Page 36 of 39

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|------------------------------|------------|
| TUNNEL WORK - FREE AIR | 06/01/2014 | \$38.40 | \$7.30 | \$13.30 | \$0.00 | \$59.00 |
| LABORERS (PREE AIR TUNNEL) | 12/01/2014 | \$39.15 | \$7.30 | \$13.30 | \$0.00 | \$59.75 |
| | 06/01/2015 | \$39.90 | \$7.30 | \$13.30 | \$0.00 | \$60.50 |
| | 12/01/2015 | \$40.65 | \$7.30 | \$13.30 | \$0.00 | \$61.25 |
| | 06/01/2016 | \$41.40 | \$7.30 | \$13.30 | \$0.00 | \$62.00 |
| | 12/01/2016 | \$42.40 | \$7.30 | \$13.30 | \$0.00 | \$63.00 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| TUNNEL WORK - FREE AIR (HAZ. WASTE) | 06/01/2014 | \$40.40 | \$7.30 | \$13.30 | \$0.00 | \$61.00 |
| ABOREKS (PREE AIR TONNEL) | 12/01/2014 | \$41.15 | \$7.30 | \$13.30 | \$0.00 | \$61.75 |
| | 06/01/2015 | \$41.90 | \$7.30 | \$13.30 | \$0.00 | \$62.50 |
| | 12/01/2015 | \$42.65 | \$7.30 | \$13.30 | \$0.00 | \$63.25 |
| | 06/01/2016 | \$43.40 | \$7.30 | \$13.30 | \$0.00 | \$64.00 |
| | 12/01/2016 | \$44.40 | \$7.30 | \$13.30 | \$0.00 | \$65.00 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| VAC-HAUL | 08/01/2014 | \$31.59 | \$9.91 | \$8.80 | \$0.00 | \$50.30 |
| TEAMSTERS JOINT COUNCIL NO. 10 ZONE B | 12/01/2014 | \$31.59 | \$9.91 | \$9.33 | \$0.00 | \$50.83 |
| | 06/01/2015 | \$31.94 | \$9.91 | \$9.33 | \$0.00 | \$51.18 |
| | 08/01/2015 | \$31.94 | \$10.41 | \$9.33 | \$0.00 | \$51.68 |
| | 12/01/2015 | \$31.94 | \$10.41 | \$10.08 | \$0.00 | \$52.43 |
| | 06/01/2016 | \$32.44 | \$10.41 | \$10.08 | \$0.00 | \$52.93 |
| | 08/01/2016 | \$32.44 | \$10.91 | \$10.08 | \$0.00 | \$53.43 |
| | 12/01/2016 | \$32.44 | \$10.91 | \$10.89 | \$0.00 | \$54.24 |
| VOICE-DATA-VIDEO TECHNICIAN ELECTRICIANS LOCAL 95 | 06/01/2013 | \$25.86 | \$7.66 | \$10.09 | \$0.00 | \$43.61 |

Apprentice - VOICE-DATA-VIDEO TECHNICIAN - Local 96 06/01/2012

| Effect Step | ive Date - percent | 06/01/2013 | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|----------------|-----------------------|------------|----------------------|--------|---------|------------------------------|------------|
| 1 | 50 | | \$12.93 | \$7.66 | \$2.85 | \$0.00 | \$23.44 |
| 2 | 55 | | \$14.22 | \$7.66 | \$2.89 | \$0.00 | \$24.77 |
| 3 | 60 | | \$15.52 | \$7.66 | \$9.78 | \$0.00 | \$32.96 |
| 4 | 65 | | \$16.81 | \$7.66 | \$9.81 | \$0.00 | \$34.28 |
| 5 | 70 | | \$18.10 | \$7.66 | \$9.85 | \$0.00 | \$35.61 |
| 6 | 75 | | \$19.40 | \$7.66 | \$9.89 | \$0.00 | \$36.95 |
| 7 | 80 | | \$20.69 | \$7.66 | \$9.93 | \$0.00 | \$38.28 |
| 8 | 85 | | \$21.98 | \$7.66 | \$9.97 | \$0.00 | \$39.61 |
| Notes: | | | | | | | |

Apprentice to Journeyworker Ratio:1:1

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|-----------------|------------------------------|-------------------|
| WAGON DRILL OPERATOR | 06/01/2014 | \$30.60 | \$7.30 | \$12.10 | \$0.00 | \$50.00 |
| LABORERS - ZONE 2 | 12/01/2014 | \$31.10 | \$7.30 | \$12.10 | \$0.00 | \$50.50 |
| | 06/01/2015 | \$31.60 | \$7.30 | \$12.10 | \$0.00 | \$51.00 |
| | 12/01/2015 | \$32.10 | \$7.30 | \$12.10 | \$0.00 | \$51.50 |
| | 06/01/2016 | \$32.60 | \$7.30 | \$12.10 | \$0.00 | \$52.00 |
| | 12/01/2016 | \$33.35 | \$7.30 | \$12.10 | \$0.00 | \$52.75 |
| For apprentice rates see "Apprentice- LABORER" | | | | | | |
| WASTE WATER PUMP OPERATOR OPERATING ENGINEERS LOCAL 4 | 06/01/2014 | \$41.49 | \$10.00 | \$14.20 | \$0.00 | \$65.69 |
| | 12/01/2014 | \$42.49 | \$10.00 | \$14.20 | \$0.00 | \$66.69 |
| | 06/01/2015 | \$43.24 | \$10.00 | \$14.20 | \$0.00 | \$67.44 |
| | 12/01/2015 | \$44.49 | \$10.00 | \$14.20 | \$0.00 | \$68.69 |
| | 06/01/2016 | \$45.24 | \$10.00 | \$14.20 | \$0.00 | \$69.44 |
| | 12/01/2016 | \$46.49 | \$10.00 | \$14.20 | \$0.00 | \$70.69 |
| | 06/01/2017 | \$47.49 | \$10.00 | \$14.20 | \$0.00 | \$71.69 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS" | 12/01/2017 | \$48.49 | \$10.00 | \$14.20 | \$0.00 | \$72.69 |
| WATER METER INSTALLER | 00/01/2014 | \$41.11 | \$0.35 | \$14.26 | \$0.00 | \$64.72 |
| PLUMBERS LOCAL 4 | 09/01/2014 | \$41.11 | \$9.35 | \$14.20 | \$0.00 | \$65.32 |
| | 03/01/2016 | \$42.36 | \$0.35 | \$14.20 | \$0.00 | \$65.07 |
| | 09/01/2016 | \$42.50 | \$9.55 | \$14.26 | \$0.00 | \$66.57 |
| | 03/01/2017 | \$42.90 | \$9.55 | \$14.20 | \$0.00 | \$67.22 |
| | 09/01/2017 | \$45.01 | \$9.55 | \$14.26 | \$0.00 | \$67.82 |
| | 03/01/2018 | \$44.21 | \$9.35 | \$14.20 | \$0.00 | \$68.47 |
| For apprentice rates see "Apprentice- PLUMBER/PIPEFTITER" or "PLUMBER/GASFT | TTER" | \$44.80 | \$9.55 | φ 1 4.20 | 50.00 | 500.47 |
| Outside Electrical - East | | | | | | |
| CABLE TECHNICIAN (Power Zone) OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 | 09/01/2013 | \$25.66 | \$8.70 | \$4.48 | \$0.00 | \$38.84 |
| For apprentice rates see "Apprentice- LINEMAN" | | | | | | |
| CABLEMAN (Underground Ducts & Cables) OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 | 09/01/2013 | \$36.55 | \$8.70 | \$6.58 | \$0.00 | \$51.83 |
| For apprentice rates see "Apprentice- LINEMAN" | | | | | | |
| DRIVER / GROUNDMAN CDL OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 | 09/01/2013 | \$29.94 | \$8.70 | \$6.05 | \$0.00 | \$44.69 |
| For apprentice rates see "Apprentice- LINEMAN" | | | | | | |
| DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 | 09/01/2013 | \$23.52 | \$8.70 | \$5.24 | \$0.00 | \$37.46 |
| For apprentice rates see "Apprentice- LINEMAN" | | | | | | |
| EQUIPMENT OPERATOR (Class A CDL) OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 | 09/01/2013 | \$36.35 | \$8.70 | \$9.43 | \$0.00 | \$54.48 |
| For apprentice rates see "Apprentice- LINEMAN" | | | | | | |
| EQUIPMENT OPERATOR (Class B CDL) OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 | 09/01/2013 | \$32.08 | \$8.70 | \$6.59 | \$0.00 | \$47.37 |
| For apprentice rates see "Apprentice- LINEMAN" | | | | | | |
| GROUNDMAN OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 | 09/01/2013 | \$23.52 | \$8.70 | \$3.72 | \$0.00 | \$35.94 |
| For apprentice rates see "Apprentice- LINEMAN" | | | | | | |
| GROUNDMAN -Inexperienced (<2000 Hrs.) OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 | 09/01/2013 | \$19.25 | \$8.70 | \$2.85 | \$0.00 | \$30.80 |
| For apprentice rates see "Apprentice- LINEMAN" | | | | | | |
| Issue Date: 11/03/2014 Wage Request Number: | 20141103- | 008 | | | | Page 38 of 39 |

| Classification | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|---|----------------|-----------|--------|---------|------------------------------|------------|
| JOURNEYMAN LINEMAN | 09/01/2013 | \$42.77 | \$8.70 | \$11.78 | \$0.00 | \$63.25 |
| OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 | | | | | | |

Apprentice - LINEMAN (Outside Electrical) - East Local 104

| Effect | ive Date - | 09/01/2013 | | | | Supplemental | |
|--------|------------|------------|----------------------|--------|---------|--------------|------------|
| Step | percent | | Apprentice Base Wage | Health | Pension | Unemployment | Total Rate |
| 1 | 60 | | \$25.66 | \$8.70 | \$4.24 | \$0.00 | \$38.60 |
| 2 | 65 | | \$27.80 | \$8.70 | \$4.71 | \$0.00 | \$41.21 |
| 3 | 70 | | \$29.94 | \$8.70 | \$5.43 | \$0.00 | \$44.07 |
| 4 | 75 | | \$32.08 | \$8.70 | \$6.16 | \$0.00 | \$46.94 |
| 5 | 80 | | \$34.22 | \$8.70 | \$6.88 | \$0.00 | \$49.80 |
| 6 | 85 | | \$36.35 | \$8.70 | \$7.62 | \$0.00 | \$52.67 |
| 7 | 90 | | \$38.49 | \$8.70 | \$8.83 | \$0.00 | \$56.02 |
| | | | | | | | |

Notes:

| | | | · · · · · · · · · · · · · · · · · · · |
|---------------------------------------|------|------|---|
| Apprentice to Journeyworker Ratio:1:2 | | | |

| TELEDATA CABLE SPLICER OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 | 07/16/2012 | \$26.33 | \$4.18 | \$2.79 | \$0.00 | \$33.30 |
|--|------------|---------|--------|--------|--------|---------|
| TELEDATA LINEMAN/EQUIPMENT OPERATOR OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 | 07/16/2012 | \$24.78 | \$4.18 | \$2.74 | \$0.00 | \$31.70 |
| TELEDATA WIREMAN/INSTALLER/TECHNICIAN OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 | 07/16/2012 | \$24.78 | \$4.18 | \$2.74 | \$0.00 | \$31.70 |
| TREE TRIMMER OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104 | 01/29/2012 | \$17.18 | \$3.37 | \$0.00 | \$0.00 | \$20.55 |

01/29/2012

\$15.15

\$3.37

\$0.00

\$18.52

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. This classification does not apply to wholesale tree removal. \$0.00

TREE TRIMMER GROUNDMAN OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104

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.

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.

| Issue Date: | 11/03/2014 |
|-------------|------------|
|-------------|------------|

WEEKLY PAYROLL RECORDS REPORT & STATEMENT OF COMPLIANCE

In accordance with Massachusetts General Law c. 149, §27B, a true and accurate record must be kept of all persons employed on the public works project for which the enclosed rates have been provided. A Payroll Form has been printed on the reverse of this page and includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the contract.

In addition, every contractor and subcontractor is required to submit, on a weekly basis, a copy of their weekly payroll records to the awarding authority. For every week in which an apprentice is employed, a photocopy of the apprentice's identification card must be attached to the payroll report. Once collected, the awarding authority is also required to preserve those reports for three years.

In addition, each such contractor, subcontractor, or public body shall furnish to the awarding authority directly, within fifteen 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:

| | ,200 |
|---|---|
| I, | , |
| (Name of signatory party) | (Title) |
| do hereby state that I pay or su | pervise the payment of the persons employed by |
| | on the |
| (Contractor, subcontractor or pub | (Building or project) |
| | |
| and that all mechanics and appr said project have been paid in a sections twenty-six and twenty- General Laws. | rentices, teamsters, chauffeurs and laborers employed on accordance with wages determined under the provisions of -seven of chapter one hundred and forty nine of the |
| and that all mechanics and appr said project have been paid in a sections twenty-six and twenty- General Laws. | rentices, teamsters, chauffeurs and laborers employed on accordance with wages determined under the provisions of -seven of chapter one hundred and forty nine of the Signature |

DIVISION OF OCCUPATIONAL SAFETY, 399 WASHINGTON STREET, 5TH FLOOR, BOSTON, MA. 02108

| | | | X | /EEKL | Y PAY | ROLL | REPO | ORT F | ORM | | | | | |
|-------------------|---------------------|------------|-----------|---------|-----------|----------|---------|--------------|---------------|-------------------------------|----------------|------------------------|----------------------------|------------------------|
| Company Name: | | | | _ | L) Pri | ime Co | ntracto | п. | | | | | | |
| Project Name: | | | | | S | ıbcontr | actor | | | | | | | |
| Awarding Auth .: | | | | | F | ist Prin | ne Con | tractor | | | | | | |
| Work Week Ending: | | | | | E | mploye | r Signa | ature: | | | | | | |
| Final Report | | | | | 'n | rint Na | me & | Title: | | | | | | |
| Employee Name & | Work Classification | | Но | urs Wor | ked | | | (A) | (B) Hourly | Emplo | yer Contrib | utions | (F) [B+C+D+E] Hourly | (G) [A*F] Weekly |
| -ruuress | | N | | ¥ | , H | τ | s | Tot. Hrs. | Base Wage | (C) Health & Welfare | (D) Pension | (E) Supp. Unemp. | Total Wage (prev. wage) | Total Amount |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | _ | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | v | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| NOTE: Ever | y contractor and su | bcontracto | or is rec | quired | to sub | mit a | copy | of the | ir weekly | ' payroll r | ecords to | the award | ling authority. | |

THE MASSACHUSETTS PREVAILING WAGE LAW (MGL. c149, §§26-27H)

AN IMPORTANT GUIDE FOR CONTRACTORS DOING PUBLIC WORKS PROJECTS IN MASSACHUSETTS

PREVAILING WAGE SCHEDULES

Every contractor should obtain a schedule of prevailing wage rates for every public works project from the Awarding Authority (city, town, county, district, state agency or authority). It is the awarding authority's responsibility to ensure that a copy of the wage schedule is provided to all contractors from whom estimates or bids are solicited for all projects. The Department of Labor and Industries (DLl) will not issue wage schedules directly to contractors or employees.

Once a wage schedule has been issued for a project by DLI, it will remain in effect for the entire project. Appeals of wage determinations or classifications of employment may be made to the DLI commissioner.

A copy of the wage schedule is required to be posted at the work site.

A wage schedule issued for a project <u>may not</u> be used on any other project. If, by chance, an Awarding Authority fails to provide you with a wage schedule to use when figuring your bid, do not use one you may have from another project.

In this case, you should contact DLI immediately and urge the awarding authority to contact DLI to correct the oversight.

The failure of an Awarding Authority to provide a wage schedule does not excuse a contractor from paying the prevailing rate.

BIDDING

The Attorney General's Division of Fair Labor & Business Practices enforces the prevailing wage law. All bids must reflect prevailing wage rates. Contractors may be required by an Awarding Authority to "demonstrate ... how (they) could complete the project and comply with Mass. Gen. Laws." The Division issued an "Advisory" discussing these and other points. For a copy, please contact the Attorney General's Office.

PAYING EMPLOYEES

Prevailing wages must be paid to all employees on public works projects regardless of whether they are employed by the general contractor, a filed sub-bidder or any sub-contractor. The prevailing wage applies equally to unionized and non-unionized workers. All employees who perform work on a public works project must be paid hourly according to the wage schedule issued for the particular project.

The wage schedule issued for each project is in effect for the duration of that project. All wage increases listed on the schedule must be paid on the specified dates.

Employers are limited in the deductions that can be made from the hourly rate (represented as the "total rate" on the wage schedules). Only contributions to the following plans may be deducted:

- 1. Health Plan
- 2. Pension
- 3. Supplementary Unemployment

All contributions must be made to bona fide plans.

If an employer contributes to any, or all, of the above plans, it may deduct the hourly amount contributed from the "total rate." If the employer does not contribute to any of the benefit plans listed above, then the employee's hourly rate of pay will be the "total rate" from the wage schedule.

All other deductions, including and not limited to the following," from the wage schedule.

All other deductions, including and not limited to the following, <u>may not</u> be subtracted from the employee's hourly wage rate:

- 1. Vacation Time
- 2. Sick Time
- 3. Training Funds
- 4. Charitable Contributions
- 5. Worker's Compensation
- 6. Unemployment Insurance
- 7. Uniforms

Overtime, which must be paid to all employees who work more than 40 hours per week, shall be at least time-and-one-half the base rate ("total rate" less benefits, if any).

Any "separate check" given to an employee as the "benefit portion" of the prevailing wage may not be treated differently than the check for "base wages." All "separate checks" are considered wages and subject to state and federal taxes, unemployment insurance, and worker's compensation requirements.

PAYROLL RECORDS

Employers are required to submit weekly-certified payroll reports to the Awarding Authority and keep them on file for three (3) years. A reporting form is sent along with each wage schedule that may be used. Each report <u>must</u> contain at least: the employee's name, address, occupational classification, hours worked and wages paid. <u>Do not</u> submit weekly payroll reports to DLI.

After each contractor completes its portion of the public works project, the contractor must submit a Statement of Compliance to DLI. A Statement of Compliance form is also sent along with each wage schedule issued.

APPRENTICES

If your company employs apprentices, they must be registered with the Division of Apprentice Training. All persons not registered with DAT must be paid the "total rate" listed on the wage schedule. An apprentice sheet showing percentages based on the apprentice steps is included with all wage schedules.

<u>PENALTIES</u>

Failure to pay the prevailing wage subjects the contractor to potential civil and criminal liability.

Wage schedules are issued by: MA Dept. of Labor & Industries 100 Cambridge St., 11th Fl. Boston, MA 02202 (617) 727-3492

Enforcement is carried out by:

Office of the Attorney General, Fair Labor & Business Practices Div. 100 Cambridge St., 11th Fl. Boston, MA 02202 (617) 727-3477

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION



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 008500

IMPORTANT NOTICE TO BIDDERS

** RESPONSIBLE EMPLOYER ORDINANCE

and

MINORITY/WOMEN BUSINESS ENTERPRISE AND WORKER UTILIZATION

BIDDERS MUST COMPLETE FORMS EOO-101 AND REO-101, WHICH ARE PART OF THE BID SUBMISSION

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.

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 ASSOCITATED FORMS CONTAINED HEREIN.

Direct any questions about these forms and procedures to:

Kenrick A. Haywood Contract Compliance Officer City Hall – Room 201 455 Main Street Worcester, MA 01608 (508) 799-1174

** This requirement applies to general bids over \$100,000 and all subcontractors at every tier exclusive of any pricing threshold.

[THIS PAGE IS INTENTIONALLY LEFT BLANK]

CITY OF WORCESTER INITIAL STATEMENT AND CERTIFICATION OF COMPLIANCE WITH THE RESPONSIBLE EMPLOYER ORDINANCE

FORM REO 101 - PAGE 1 OF 2

PROJECT:

CONTRACTOR:

ALL GENERAL BIDDERS, PROPOSERS, TRADE CONTRACTORS, SUBCONTRACTORS, INCLUDING SUBCONTRATORS 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:

- 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 <u>weekly</u> basis for the entire duration of the project;{COMPLIANCE WITH THE APPRENTICE TRAINING PROVISION OF THE RESPONSIBLE EMPLOYER ORDINANCE IS CURRENTLY SUSPENDED}
- 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

CITY OF WORCESTER INITIAL STATEMENT AND CERTIFICATION OF COMPLIANCE WITH THE RESPONSIBLE EMPLOYER ORDINANCE

FORM REO 101 - PAGE 2

PROJECT:

CONTRACTOR:

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/<u>Company</u>)

By: _____

(Name/Signature)

Date: _____

By:______ (Print Name and Corporate Title

(Seal)

[THIS PAGE IS INTENTIONALLY LEFT BLANK]

CITY OF WORCESTER RESPONSIBLE EMPLOYER ORDINANCE REQUIREMENTS (CONT'D)

FORM REO 103 PAGE 10F 1

PROJECT:

CONTRACTOR:

POST CONTRACT AWARD SUBMISSIONS

THE SUCCESSFUL GENERAL CONTRACTOR, CONSTRUCTION MANAGER AT RISK, TRADE CONTRACTORS AND SUBCONTRACTORS, INCLUDING SUBCONTRATORS 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.

[THIS PAGE IS INTENTIONALLY LEFT BLANK]

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. <u>AFFIDAVIT OF ACKNOWLEDGEMENT AND CERTIFICATION OF COMPLIANCE</u>, 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. <u>SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY ANTI-DISCRIMINATION</u> <u>AND AFFIRMATIVE ACTION PROGRAM</u> 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. <u>SUCCESSFUL BIDDER'S OBLIGATION TO PROCEDURES AND FORMS,</u> 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.
[THIS PAGE IS INTENTIONALLY LEFT BLANK]

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 \square or IS NOT \square certified by the State Office of Minority and Women Business Assistance to be a minority or women owned and operated business; and
- **III.** WILL \Box or WILL NOT \Box subcontract any portion of this contract.

| Project Name: | Bid Number |
|-----------------------|---------------|
| Authorized Signature: | Business Name |
| Printed Name: | _Title: |
| Address: | _ Date: |

[THIS PAGE IS INTENTIONALLY LEFT BLANK]

FORM EOO-D/3

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:

- 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

- 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, 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

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. <u>BUILDING TRADES – CONTACT LIST,</u> 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. <u>AFFIDAVIT OF ACKNOWLEDGEMENT and CERTIFICATION OF</u> <u>COMPLIANCE, (FOR SUBCONTRACTORS),</u> 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 <u>PRIOR</u> to beginning work on the project.

III. <u>TABLE OF PROJECTED SUBCONTRACTORS</u>, 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. <u>QUARTERLY PROJECTED WORKFORCE TABLE,</u> 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. <u>REQUEST FOR MODIFICATION</u>

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 <u>ONLY</u> 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. <u>INITIAL STATEMENT and CERTIFICATION OF COMPLIANCE WITH THE</u> <u>RESPONSIBLE EMPLOYER ORDINANCE, REO-101 (Pages 1 & 2)</u>

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. <u>WEEKLY STATEMENT AND CERTIFICATION OF COMPLIANCE WITH THE</u> <u>RESPONSIBLE EMPLOYER ORDINANCE, REO-102</u>

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. <u>INITIAL STATEMENT AND ADDITIONAL CERTIFICATION OF COMPLIANCE</u> <u>WITH THE RESPONSIBLE EMPLOYER ORDINANCE, REO-103</u>

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 <u>PRIOR</u> to the subcontractor beginning work on the project.

X. <u>WEEKLY CERTIFIED PAYROLL REPORT and WEEKLY WORKFORCE</u> <u>UTILIZATION REPORT</u>.

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.

SECTION 01010 - SUMMARY OF WORK

PART 1 – GENERAL

1.1 CONTRACT DOCUMENTS

A. The Contract Documents include the Drawings as enumerated on the Title Drawing, the general provisions of Contract, including General and Supplemental Conditions, and the provisions of this Project Manual and Addenda as a whole represent and describe the work and requirements of the Project.

1.2 GENERAL REQUIREMENTS

Attention is directed to the general and supplementary conditions and Division 1 including all sub-divisions therein attached in this document and drawings, which are made a part of this section.

1.3 SUBSTANTIAL COMPLETION

- A. The Date of Substantial Completion shall be eight months (240 days) for Contract work.
 - 1. The Date of Substantial Completion shall remain the same, as stated above, regardless of any alternate(s) chosen to be included in the Contract by the Owner.
- B. The Contractor shall obtain a Certificate of Occupancy on or before the Date of Substantial Completion.

1.4 PROJECT DESCRIPTION

A. The project scope generally consists of the replacement of an existing 12,000 square foot metal building with a new 12,000 square foot metal building on the same foundation and slabon-grade. The metal building system includes an elevated partial second floor area containing storage, mechanical and electrical rooms. The metal building system includes the entire building envelope except for the glazed enclosure of the building entrance lobby.

Demolition work includes existing concrete and asphalt paving and existing building construction above the existing slab-on-grade.

Construction includes improvements to the building foundations, foundation waterproofing and drainage, new insulated concrete floor slabs constructed over the existing slab, the glazed enclosure of the building entrance lobby, partitions, ceilings, finishes, specialties, furnishings, and fire protection, plumbing, HVAC, electrical and communication systems.

Site work includes clearing vegetation, storm drainage and utility trenching and backfilling, storm drainage systems, grading, concrete and asphalt paving, fencing, lighting, flagpole and landscape planting. Some of the site work is to be the work of Alternate Number 1.

Construction of a covered trailer storage canopy including its foundations is to be work of Alternate Number 2.

B. The Work of this project shall be performed by the general contractor and filed subcontractors.

C. The Work of this project also includes the requirements in the Contract, the Sub-Contract(s), Sections 0 and Division 1 Sections, in their entirety.

RELATED WORK UNDER OTHER CONTRACTS

- A. Work by other contractors, which will be under separate contract, may take place during the work of this contract adjacent to and within work areas of this site
- B. Cooperate fully with other contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this contract.

1.5 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies; perform demolition work in accordance with applicable rules, regulations, codes, and ordinances of local, state and federal authorities.
- B. Obtain and pay for necessary building permits, licenses and certificates and give notices as required during the performance of the Work.
- C. Provide 4 copies of shop drawings and literature for Architects review and approval for the items referenced in the specifications.
- D. Provide schedule and work plan within one week of the contract signing.
- E. Attend weekly meetings (or as scheduled) with the Architect and Owner's Representative as scheduled.
- F. Provide all Closeout documents including, final acceptance, warranties, guaranties and bonds.

1.6 RELATED WORK UNDER OTHER CONTRACTS

- A. Work by other contractors, which will be under separate contract, may take place during the work of this contract adjacent to and within work areas of this site. This work, under other contract, shall be coordinated between the different General Contractors. The security system will be installed by the Owner under separate Contract and the general Contractor shall work with the Owners vendor to coordinate their work with the General contractors work.
- B. Cooperate fully with separate contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this contract.

1.7 WORK SEQUENCE SCHEDULING AND COORDINATION

- A. The Work shall be sequenced, scheduled, and coordinated to achieve the Date of Substantial Completion.
 - 1. All deliveries must be scheduled at a minimum of 48-hours in advance with the Architect and Owner.
 - 2. All existing utility tie-in's must be scheduled and coordinated at a minimum of 72-hours in advance with the Architect and Owner.
- B. The General 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.

- C. The General 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.
- D. General 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.

1.8 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.
- 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.
- C. The Contractor shall pay any overtime required for the City's Clerk of Works/Owner's Representative to be on site for any work performed outside of normal working hours as defined above. No work shall take place outside of normal working hours without prior approval and the City's Clerk of Works/Owner's Representative on site.
- D. Any project related activities may not interfere with the enjoyment and use of abutting areas within the building or adjacent properties during any extended work hours.

1.9 CONTRACTOR USE OF THE PREMISES

- A. General Contractor shall have use of the site from date of contract to the Date of Substantial Completion as described above in the Work Hours paragraph.
- B. Construction vehicle access and deliveries to the project shall be made during working hours.
- C. All contractor personnel shall enter and exit the construction area through Access Driveway.
- D. Do not close or obstruct the parking lot, driveways or sidewalks without the proper permit. Conduct operations with minimum traffic interference.
- E. The General Contractor shall also be responsible for returning the public areas adjacent to each work area to their original state prior to the start of work in that area.
- F. The use of internal combustion engine driven power equipment is prohibited within the building. Alternate power sources, i.e. generators and compressors, may be placed outside the building to provide power to equipment. Placement of any alternate power sources shall be subject to prior Architect and Owner approval.
- G. There will be no washing or washing out of any vehicles at the project site. The contractor shall make necessary provisions to accommodate this work off site.

H. All cleaning and wash-down of tools and/or equipment shall be performed in areas designated only by the Architect. This will be strictly enforced.

1.10 CONTRACTOR USE OF CITY STREETS

- A. The General Contractor's personnel, and all other personnel employed on the project, shall limit their parking on the site to within the areas designated for construction parking and as permitted by the General Contractor. Additionally, Contractor personnel may park as legally allowed within City Limits. Parking on street sidewalks is prohibited.
- B. Driveway entrances, walks, and yards to abutting properties shall be kept unobstructed at all times.

1.11 WORK CONDITIONS

- A. Neither the General 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. Radios or any type of "music" broadcasting systems are not allowed.
- E. This site is smoke-free; therefore smoking is prohibited within the site limits.

1.12 PROJECT MANAGER, SUPERINTENDENTS, FIELD ENGINEER AND FOREMAN

- A. The General 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.
- B. The General Superintendent shall supervise and direct the activities of other superintendents and foremen on site. He shall not perform the work of foremen, tradesmen, or home office staff.
- C. Each filed sub-bidder and each subcontractor shall provide a Lead Foreman, responsible to be on site full time during the workday.
- D. Each foreman, in addition to his regular duties shall be responsible for establishing, maintaining, and providing record drawings, which are required to be updated prior to submitting the current period's draft Application for Payment.
- E. The General Superintendent and Lead Foreman shall not be discharged or changed without prior written consent of the Architect, which will not be unreasonably withheld. The Architect will require that all as-built information be updated and current prior to granting consent.

1.13 DAILY REPORTS AND WEEKLY OUTLINE SCHEDULE

A. The General Superintendent shall provide a "Daily Report" to the Clerk of Works containing the following:

- 1. Name and manpower of each Contractor, filed Sub-Contractor and Sub Contractor.
- 2. Equipment used.
- 3. Delivery of products received on site.
- 4. Weather conditions at start and end of each day and any significant changes or events during the day.
- 5. Significant problems, hazards or accidental injury occurring during each shift.
- 6. Summary of progress made each day.
- B. A photocopy may be made of the same "Daily Report," containing the information above, that is used by the General Superintendent. The General Superintendent may obscure confidential portions of his "Daily Report" if desired. Reports are due the following day.
- C. The Superintendent shall provide the Clerk of Works a written "Weekly (look ahead) Outline Schedule" of work activities planned at the beginning of each week, for that week. The "Weekly Outline Schedule" may be a simple listing of each trade's activities delineating areas where work is to be scheduled. Note any significant milestones.

1.14 CERTIFICATE OF SUBSTANTIAL COMPLETION

- A. The Architect shall issue a Certificate of Substantial Completion for the work when and if all of the following conditions have been met:
 - 1. The work is sufficiently complete to allow the Owner beneficial use of the premises. The work remaining to be done is not a danger to the proposed occupants and is of a minor nature.
 - 2. The work is sufficiently complete that the Architect may make affidavits to the Building Official as required by Controlled Construction provisions of the Building Code.
 - 3. The mechanical and electrical systems are fully operational. Required inspections and tests have been successfully completed, and the Owner has been provided instructions regarding operation and maintenance of mechanical and electrical systems in the building.
 - 4. The Contractor has made notifications required to pay cost of final billing for utilities and termination of property insurance.
 - 5. The Owner has made notifications required to assume the future cost of utilities, and provide property insurance.
 - 6. The Building Official has issued a Certificate of Occupancy without restrictions or conditions relating to the contractor's work.

1.15 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: Worcester Police Department:

Police Details Hourly rate for one-half day or full day. Permits for Sunday and Holiday work Fee Required.

Department of Public Works, Permits Division

Street Opening Permit Bond \$ 5,000.00 Barricade Placement by DPW 1st \$85 per day Each additional \$ 40 per day **Drainlayers** License New \$ 200.00 Annual Renewal \$ 100.00 Drain Permit \$180.00 Main Inspection \$ 2.90 per Foot Assessment To be Determined Plan Review \$ 100.00 Street Obstruction \$150.00 each Street Obstruction (Blanket Permit) \$ 1,000.00 per year Street Opening Pavement older than 5 years \$ 156.00 Pavement 5 years old or less \$ 300.00 **Driveway Opening** Permit \$ 156.00 Wastewater Discharge Permit \$ 250.00 Inspection \$400.00 Sewer use \$ 6.29/CCF Water meter, etc. Contact Water Department at 508-799-1492. Traffic and Parking. Contact Department at 508-799-1468.

Worcester Fire Department

Fire and Smoke Alarm Automatic Sprinkler and Standpipes Contact Worcester Fire Department at 508-799-1826.

Department of Inspectional Services

Building Permit

Based on total contract price \$11/\$1,000 up to first million dollars. \$8.00 per each \$1,000.00 over \$1,000,000. Orders of Building Official under Chapter 1, 780 CMR. Ticket violation under Chapter 33, 780 CMR.

Trash Control Ticket for Violations

Environmental Control Air, Water, Noise Pollution - Ticket for Violations Conservation Commission Enforcement Officer

1.17 UTILITY COMPANY BACKCHARGES

A. The Electric backcharge from N-GRID or Verizon Communications are not known at the this time, the Electrical Contractor shall file for all N-Grid and Verizon permits and submit all data and documents as required, and shall pay the required permit and inspection fees. The actual cost of the N-Grid backcharge shall paid by the City directly. All related inspection costs or other fees shall be paid as part of the Contract.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

SECTION 010450 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, are hereby made a part of this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for cutting and patching work not specified elsewhere.
- B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
 - 1. Requirements of this Section apply to all Sections of the Specifications, including mechanical and electrical installations.
- C. Any finished new work required to be cut out due to lack of coordination and scheduling, will be repaired by the trade causing cutting and patching to be done. This work will be done at no additional cost to the Owner.

1.3 SUBMITTALS

- A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures seven (7) days in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:
 - 1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.
 - 2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
 - 3. List products to be used and firms or entities that will perform Work.
 - 4. Indicate dates when cutting and patching will be performed.
 - 5. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
 - 6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
 - 7. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.
 - 1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
 - a. Foundation construction.
 - b. Bearing walls.
 - c. Structural concrete.
 - d. Lintels.
 - e. Structural decking.
 - f. Miscellaneous structural metals.
 - g. Piping, ductwork, and equipment.
- B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.
 - 1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
 - a. Primary operational systems and equipment.
 - b. Air or smoke barriers.
 - c. Water, moisture, or vapor barriers.
 - d. Membranes and flashing.
 - e. Control systems.
 - f. Communication systems.
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.
 - 1. If possible, retain the original installer or fabricator to cut and patch the following categories of exposed Work, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm:
 - a. Acoustical ceilings.
 - b. Carpeting.
 - c. Vinyl flooring.

1.5 WARRANTY

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with material in such a manner so as not to void any existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.
 - 1. Before proceeding, meet at the site with parties involved in cutting and patching. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- B. All cutting and patching by all trades shall be done under direction and coordination of the General Contractor. Accurately lay out all conduit runs, piping, recessed items, etc.
- C. Inspect existing conditions of project, including elements subject to damage or to movement, during cutting and patching.
- D. After uncovering work, inspect conditions affecting installation of products, or performance of work.
- E. Report unsatisfactory or questionable conditions to the Architect in writing; do not proceed with work until Architect has provided further instructions.
- F. No holes or slots shall be drilled through any structural member. Inspect holes after finishes have been removed to assure that substrate is not structural. No holes to be blindly drilled through walls, ceilings, etc.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building.
- E. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.
- F. Provide devices and methods to protect other portions of project from damage.
- G. Provide protection from elements for that portion of the project, which may be exposed by cutting and patching work.

3.3 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction.
 - 1. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Cut through concrete and masonry using a cutting machine, such as a carborundum saw or diamond core drill.
 - 4. Comply with requirements of applicable Sections of Division 2 where cutting and patching requires excavating and backfilling.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
 - 1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
 - 2. 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.
- D. Execute cutting and demolition by methods, which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.

- E. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.
- F. Restore work, which has been cut or removed to match the original adjacent surfaces exactly in color, material and texture. Include repainting of new work. Install new products to provide completed work in accordance with requirements of Contract Documents.
- G. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces. All penetrations through separation walls shall be sealed with fire stopping sealant. All penetrations through foundations and exterior walls shall be sealed watertight and shall include proper flashings, drip loops, weatherproof covers, etc. as necessary.
- H. Dust and debris from cutting shall be cleaned up immediately after.

3.4 HOLES

- A. The General Contractor and subcontractors shall drill all their own holes if sleeves were missed, improperly placed, or not large enough. Holes made by the General Contractor and subcontractors shall be accurate and neat and not just punched out. No long slots shall be made where piping or conduit may be placed in individual holes. No cutting or patching shall be done which, in the opinion of the Architect, will endanger or impair construction or finish.
- B. No cores shall be drilled in concrete walls or slabs in excess of six (6) inches without prior approval from the Structural Engineer. The Structural Engineer must approve any cutting of structural steel.
- C. Holes cut in fire-resistive walls and floors shall be neatly made and consistent with listing for firestopping assembly to be used.

3.5 CLEANING

A. Thoroughly and completely clean areas and spaces where cutting and patching is performed or used as access. Remove paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finish is applied. Restore damaged pipe covering to its original conditions.

SECTION 010500 - FIELD ENGINEERING

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 a part of this Section.

1.2 SUMMARY

- A. General: This Section specifies administrative and procedural requirements for field engineering services, including, but not necessarily limited to, the following:
 - 1. Land survey Work.
 - 2. Civil engineering services.
 - 3. Structural engineering services.

1.3 SUBMITTALS

- A. Certificates: Submit a certificate signed by the Land Surveyor or Professional Engineer certifying that the location and elevation of improvements comply with the Contract Documents.
- B. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of Sections 013000 "Submittals" and 017000 "Project Closeout".

1.4 QUALITY ASSURANCE

A. Surveyor: Engage a Registered Land Surveyor registered in Massachusetts, to perform land-surveying services required. Surveyor to be on site from start to completion of excavation and foundation work. All foundations to be set with transit, not string line.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The Surveyor will identify any existing control points and property line corner stakes.
- B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks before proceeding to layout the Work. Locate

and protect any existing benchmarks and control points. Preserve permanent reference points during construction.

- C. Do not change or relocate benchmarks or control points without prior written approval.
 - 1. Promptly replace lost or destroyed project control points. Base replacements on the original survey control points.
- D. Establish and maintain a minimum of two (2) permanent benchmarks on the site, referenced to data established by survey control points.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- E. Existing utilities and equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction. Contact Dig-Safe (1-800-322-4844) seventy-two (72) hours in advance of any excavation.
 - 1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer and water service piping.

3.2 PERFORMANCE

- A. Working from lines and levels established by the property survey, establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.
 - 1. Advise entities engaged in construction activities, of marked lines and levels provided for their use.
 - 2. As construction proceeds, check every major element for line, level and plumb.
- B. Surveyor's Log: Maintain a surveyor's log of control and other survey Work. Make this log available for reference.
 - 1. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.
 - 2. On completion of foundation walls, underground sanitary piping, water piping, major site improvements, and other Work requiring field engineering services, prepare a certified survey showing dimensions, locations, angles and elevations of construction and sitework.

- C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.
- D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, and locations, floor level and control lines and levels required for all trades to complete their work.
- E. Existing Utilities: Furnish information necessary to adjust, move or relocate lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities having jurisdiction.
- F. Final Property Survey: Before Substantial Completion, prepare a final property survey showing significant features (real property) for the Project. Include on the survey a certification, signed by the Surveyor, to the effect that principal metes, bounds, lines and levels of the Project are accurately positioned as shown on the survey.
 - 1. Recording: At Substantial Completion, have the final property survey recorded by or with local governing authorities as the official "property survey".

SECTION 012000 - PROJECT MEETINGS

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 a part of this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:
 - 1. Pre-Construction Conference.
 - 2. Pre-Installation Conference.
 - 3. Bi-Weekly Progress Meetings.
 - 4. Coordination Meetings.
 - 5. Project Closeout Conference.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 010270 "Applications for Payment" for procedures on submitting requisitions.
 - 2. Division 1 Section 010400 "Project Coordination" for procedures for coordinating project meetings with other construction activities.
 - 3. Division 1 Section 013000 "Submittals" for submitting the Contractor's Construction Schedule.
 - 4. Division 1 Section 017000 "Project Closeout" for procedures and issues surrounding Project Completion.

1.3 PRE-CONSTRUCTION CONFERENCE

- A. Schedule a pre-construction conference before starting construction, immediately after execution of the Agreement. Conference is to be held at the Project Site, or other agreed upon location, at a time convenient to both the Owner and Architect. Conduct the meeting to review responsibilities and personnel assignments. Submit agenda to Architect and Owner three (3) days prior to meeting date.
- B. Attendees: Authorized representatives of the Owner, Architect, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
- C. Agenda: Discuss items of significance that could affect progress, including the following:

- 1. Introduction of All Project Members.
- 2. Distribution of Contract Documents.
- 3. Procedures Outlined for Contract Compliance Issues.
- 4. Tentative Construction Schedule; Making Notes of Critical Dates.
- 5. Critical Work Sequencing.
- 6. Pre-Installation Conferences.
- 7. Work Hours.
- 8. Use of the Premises.
- 9. Deliveries.
- 10. Security Procedures.
- 11. Parking and Site Access Issues.
- 12. Office, Work, and Storage Areas.
- 13. Housekeeping & Cleaning of Construction Areas.
- 14. Safety Procedures.
- 15. First Aid.
- 16. Procedures for Creating Monthly Cash Flow/Schedule.
- 17. Procedures for processing Draft Application for Payment Periodic Submittals Certification Statement.
- 18. Procedures for processing Applications for Payment.
- 19. Procedures for RFI's, SI's, RFP's, COP's, CCD's, CO's, etc...
- 20. Procedures for Keeping Logs on RFI's, SI's, RFP's, COP's, CCD's, CO's, etc...
- 21. Project Coordination Procedures & Drawings.
- 22. Project Meetings & Meeting Minutes.
- 23. Unit Prices.
- 24. Procedures for Submittals.
- 25. Quality Control, Inspections, and Testing.
- 26. Temporary Facilities.
- 27. Preparation of Project Closeout Documents.
- D. The Contractor shall record and promptly distribute minutes of this meeting to all project members (in attendance or not), including the Architect and Owner, and as additionally directed by the Architect.
 - 1. Meeting Minutes shall be in a standard type-written format to remain consistent for every project meeting and include, but not limited to, the following items:
 - a. Detailed notes from all discussions of project business items in chronological order.
 - b. Updated Project Contractor, Subcontractor, Vendor List.
 - c. Updated Construction Schedule.

1.4 PRE-INSTALLATION CONFERENCES

- A. Conduct a pre-installation conference at the Project Site before each construction activity that requires coordination with other construction.
- B. Attendees: The 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 the Architect of scheduled meeting dates.

- 1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related Change Orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Shop Drawings, Product Data, and quality-control samples.
 - g. Review of mockups or finish samples.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.
 - 1. Manufacturer's recommendations.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities.
 - q. Existing Occupancies.
 - r. Space and access limitations.
 - s. Governing regulations.
 - t. Safety.
 - u. Inspecting and testing requirements.
 - v. Required performance results.
 - w. Recording requirements.
 - x. Protection.
- 2. The Contractor shall record significant discussions and agreements and disagreements of each conference, and the approved schedule. The Contractor shall promptly distribute the record of the meeting to everyone concerned, including the Owner and the Architect.
- 3. Do not proceed with the installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.5 PROGRESS MEETINGS

- A. Conduct progress meetings at the Project Site weekly. Notify the Owner and the Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request. General Contractor to record minutes of all meetings.
- B. Attendees: In addition to representatives of the Owner and the Architect, each subcontractor, supplier, or 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 the Project and authorized to conclude matters relating to the Work.

- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.
 - 1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.
 - 2. Review the present and future needs of each entity present, including the following:
 - a. Interface Requirements.
 - b. Time & Project Progress.
 - c. Work Hours.
 - d. Updated Weekly Look-Ahead Schedule.
 - e. Critical Work Sequencing.
 - f. Off-Site Fabrication Problems.
 - g. Updated Pre-Installation Conference Schedule.
 - h. Deliveries.
 - i. Use of the Premises.
 - j. Security Procedures.
 - k. Parking Issues & Snow Removal.
 - 1. Office, Work, and Storage Areas.
 - m. Housekeeping & Cleaning of Construction Areas.
 - n. Safety Procedures.
 - o. First Aid.
 - p. Draft Application for Payment Periodic Submittals Certification Statement (At Appropriately Timed Meeting Each Month).
 - q. Updated Submittal, RFI, SI, RFP, COP, CCD, and CO Logs.
 - r. New Submittals, RFI's, SI's, RFP's, COP's, CCD's, CO's, etc...
 - s. Any Project Coordination Issues or Drawings.
 - t. Quality Control, Inspections, and Testing.
 - u. Temporary Facilities.
 - v. Preparation of Project Closeout Documents.
 - 3. The Contractor shall record and promptly distribute minutes of this meeting to all project members (in attendance or not), including the Architect and Owner, and as additionally directed by the Architect.
 - a. Meeting Minutes shall be in a standard type-written format to remain consistent for every project meeting and include, but not limited to, the following items:
 - (i) Detailed notes from all discussions of project business items in chronological order.
 - (ii) Updated Project Contractor, Subcontractor, Vendor List.
 - (iii) Updated Construction Schedule.

- (iv) Updated Weekly Look-Ahead Schedule.
- (v) Updated Submittal, RFI, SI, RFP, COP, CCD, and CO Logs.

1.6 COORDINATION MEETINGS

A. Conduct coordination meetings with all trades convenient for all parties involved. In addition conduct coordination meetings when requested by the Architect or Clerk of Works.

1.7 TIME OF PROGRESS AND COORDINATION MEETINGS

A. Conduct both meetings weekly on a day agreeable to all parties, at a designated location at the site, or other agreed upon location.

1.8 PROJECT CLOSEOUT CONFERENCE

A. The Project Close-Out Conference shall be conducted at a time convenient for all parties involved prior to Substantial Completion. Refer to Section 01700 – Project Closeout for additional information for requirements.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

SECTION 012200

UNIT PRICES

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

Attention is directed to the general and supplementary conditions and Division 1 including all sub-divisions therein attached in this document and drawings, which are made a part of this section.

1.01 DESCRIPTION

- A. Scope of Work:
 - 1. This Section covers those items for which indefinite quantities can be expected and, therefore, pre-agreed prices per unit of work are established as means to determine adjustments to the Contract Price after actual quantities are determined.
- B. Related Work Specified Elsewhere:
 - 1. Refer to Division 1 for limitations.
 - 2. Examine Contract Documents for requirements that affect work of this Section.

1.03 QUANTITIES AND COST ADJUSTMENTS

- A. Refer to this Section and individual Specification Sections for methods of measurement and payment for unit prices. As soon as the work involved in each unit cost item has been completed, submit documentation to establish the actual quantities provided. Submit to the Architect for review and issuance of Change Order.
- B. Change Order amount for each unit cost item will be based on actual quantities multiplied by the unit cost. This unit cost is a total cost and includes all mark-ups applicable taxes, overhead, and profit as described below.

1.04 UNIT PRICES

- A. General Provisions
 - 1. Materials, methods of installation and definitions of terms set forth under the various unit price items are indicated in the Schedule of Unit Prices and indicated in the Contract Documents.
 - 2. Performance of work which is not required under the Contract Documents or which is not authorized by Change Order, whether or not such work item is set forth hereunder as a Unit Price Item, shall not be considered cause for any extra payment. The Contractor will be held fully responsible for such unauthorized work, including the performance of all corrective measures required by the Architect or Owner.

- 3. The Owner may choose not to approve any or all unit prices prior to award of the contract if it deems the unit price unreasonable. In this case, the Owner at their discretion may choose to:
 - a. negotiate the unit costs prior to signing the contract;
 - b. disapprove any or all of the unit prices and adjust the work on the change order process; or
 - c. disqualify the bidder if the Owner deems the unit prices to be unreasonable.
- B. Schedule of Unit Prices: Should certain additional work be required, or should the quantities of certain classes of work be increased or decreased from those required by the Contract Documents, by authorization of the Owner, the below unit prices shall, at the option of the Owner, be the basis of payment to the Contractor or credit to the Owner, for such increase or decrease in the work. The Unit Prices shall represent the exact total cost per unit to be paid the Contractor (in the case of additions or increases) or to be refunded the Owner (in the case of decreases). No additional adjustment will be allowed for overhead, profit, insurance, or other direct or indirect expenses of the Contractor or Subcontractors. No additional adjustments will be allowed for additional work without the prior written approval of the Owner.
- 1. Carry in the Base Bid a quantity of (31) 50 KIP piles/pile caps and extensions (Pile at exterior wall). Assume a depth of 10'-0".
- 2. Carry in the Base Bid a quantity of (21) 50 KIP piles/pile caps/ plates and extensions (Pile at interior column). Assume a depth of 10'-0".
- C. The above unit prices shall include all labor, materials, overhead, profit, insurance, etc., to cover the finished work. Changes shall be processed in accordance with the provisions of Division 1 governing Changes in the Work.
- PART 2 PRODUCTS Not Used.

PART 3 EXECUTION - Not Used.

SECTION 012300 – ALTERNATES

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, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate Number 1:

State the amount to be ADDED for All Site Work as currently planned as indicated on the Drawings. Work consists of all paving, curbing and bollards outside 25'-0" of the building perimeter, all landscaping, flagpole, site fencing, electric fence/gate, catch basin drainage and traffic markings.

B. Alternate Number 2:

State the amount to be added State the amount to be ADDED for the Covered Trailer Storage Building as shown on A1.4.

Base bid work includes excavation and installing the feeders and conduits from the transformer pad to the building and conduit from electric gate to building, and capping the conduits inside.

SECTION 012500- SUBSTITUTION PROCEEDURES

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 014200 "Reference" 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 013300 "Submittal Proceedures".
 - 2. Procedural requirements governing the Contractor's selection of products and product options are included under Section 016000 "Product Requirements".

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 <u>do not constitute an acceptable or valid request for substitution</u>, <u>nor do they constitute approval</u>.
- 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)

END OF SECTION 012500

SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

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.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Division 1 Section 012900 "Payment Procedures" for administrative procedures governing applications for payment.
 - 2. Division 1 Section 013300 "Submittal Procedures" for requirements for the Contractor's Construction Schedule.
 - 3. Division 1 Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 MINOR CHANGES IN THE WORK

A. Supplemental instructions authorizing minor changes in the Work, not involving an adjustment to the Contract Sum or Contract Time, will be issued by the Architect on the City's Form of Supplemental Instructions.

1.4 REQUEST FOR PROPOSAL

- A. Owner initiated Request for Proposal: Proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time will be issued by the Architect, with a detailed description of the proposed change and supplemental or revised Drawings and Specifications, if necessary.
 - 1. Proposal requests issued by the Architect are for information only. Do not consider them an instruction either to stop work in progress, or to execute the proposed change.

1.5 PROPOSED CHANGE ORDER

A. Proposed Change Order: Using the form at the end of this section submit your proposal for the adjustment to the Contract Sum or Contract Time in response to a Request for Proposal or for Contractor initiated request for a change with Proposed Change Order.

- 1. Unless otherwise indicated in the Request For Proposal, within twenty (20) days of receipt of the proposal request, submit to the Architect for the Owner's review an estimate of cost necessary to execute the proposed change.
 - a. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 - b. Indicate delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
- B. Contractor initiated request for change with Proposed Change Order: When latent or other unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Architect.
 - 1. Include a statement outlining the 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 Contract Time.
 - a. Include a list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 - b. Indicate delivery charges, equipment rental, and amounts of trade discounts.
 - c. Comply with requirements in Section 01631 "Product Substitutions" if the proposed change in the Work requires the substitution of one product or system for a product or system specified.

1.6 ALLOWANCES

- A. Allowance Adjustment: Base each Change Order Proposal Request for an allowance cost adjustment solely on the difference between the actual purchase amount and the allowance, multiplied by the final measurement of work-in-place, with reasonable allowances, where applicable, for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - 1. Include installation costs in the purchase amount only where indicated as part of the allowance.
 - 2. When requested, prepare explanations and documentation to substantiate the margins claimed.
 - 3. The Owner reserves the right to establish the actual quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit, within twenty (20) days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Claims submitted later than twenty (20) days will be rejected.
 - 1. The Change Order cost amount shall not include the Contractor's indirect expense except when it is clearly demonstrated that either the nature or scope of

work required was changed from that which could have been foreseen from information in Contract Documents.

2. No change to the Contractor's indirect expense is permitted for selection of higher or lower priced materials or systems of the same scope and nature as originally indicated.

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. A Construction Change Directive shall be issued for all work involving a change in contract cost or time. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. The Construction Change Directive will contain a complete description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time, or is for a lump sum amount approved by the Architect.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive, if so directed by the Architect.
 - 1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.8 CHANGE ORDER PROCEDURES

A. Upon the Owner's approval of a Change Order Proposal Request, the Architect will issue a Change Order for signatures of the Owner and Contractor.

1.9 OVERHEAD AND PROFIT

- A. Overhead and Profit will be as noted elsewhere in these specifications.
 - 1. Labor rates shall not exceed those shown in the contract specifications as set forth by the Department of Labor and Industries.
- B. In reviewing Change Orders, the Architect will exercise his right to request a complete breakdown from the contractor showing exact costs for labor and material, as well as delivery slips and invoices from suppliers and other subcontractors.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 – PAYMENT PROCEDURES

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 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 008000
 - 2. Section 009000
 - 3. Section 009500
 - 4. Section 012600
 - 5. Section 013000
 - 6. Section 017700

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 Construction Schedule, List of Subcontracts, and Submittal Schedule.
- B. The Contractor's Construction Schedule and Submittal Schedule are included in Section 013000 "Submittals".

1.3 PROGRESS SCHEDULE

- A. Prepare the Progress Schedule in accordance with Article 8, Paragraphs 8.2.3 and 8.2.4 of the General Conditions for approval by the Architect.
 - 1. The Progress Schedule shall conform to the requirements in Section 01300, paragraph 1.4, Contractor's Progress Schedule and the sample bound in the aforementioned paragraph.

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 Schedule of Values to the Architect at the earliest possible date, but no later than seven (7) days before the date scheduled for submittal of the initial Application for Payment.
- B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values. Provide at least one (1) line item for each Specification Section. Coordinate with the Architect for exact breakdown of 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. Dollar value to nearest dollar.
 - i. 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, 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.
- 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.

1.5 APPLICATIONS 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.
 - 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 Progress Schedule. The format to which is subject to the Architect's approval.
- 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 General Contractor 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 up-dated 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. Approved Contractor's Progress Schedule see Section 01300, Paragraph 1.4.
- 5. Contractor's Construction Schedule (preliminary if not final).
- 6. Schedule of principal products.
- 7. Submittal Schedule (preliminary, if not final).
- 8. List of Contractor's staff assignments.
- 9. List of Contractor's principal consultants.
- 10. Copies of building permits.
- 11. Copies of authorizations, permits and licenses from governing authorities for performance of the Work.
- 12. Initial progress report.
- 13. Report of pre-construction meeting.
- 14. Schedule of Pre-installation meetings.
- 15. Certificates of insurance and insurance policies.
- 16. Performance and payment bonds.
- 17. Data needed to acquire Owner's insurance.
- 18. Initial settlement survey and damage report, if required.
- 19. 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.
 - 1. 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.

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: By: Timothy Boucher, Director | Signed: By: Rob Para Jr., Architect |
|--|--|
| Date: | Date: |
| Signed:By: | Signed: 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 _____

_____, 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

(Name of Contractor)

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.

(Name of contractor)

_____ hereby certify, that the Periodic

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

PAYMENT PROCEDURES

I,

SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION

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 a part of this Section.

1.2 SUMMARY

- A. This Section specifies administrative and supervisory requirements necessary for project coordination including, but not limited to the following:
 - 1. Coordination and cutting, drilling and patching.
 - 2. General installation provisions.
 - 3. Administrative and supervisory personnel.
 - 4. Cleaning and protection.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Project meetings, coordination meetings, and pre-installation conferences are included in Section "Project Meetings."
 - 2. Requirements for preparing and submitting the Contractor's Construction Schedule are included in Section "Submittals."

1.3 COORDINATION

- A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the specifications that depend on each other for proper installation, connection, and operation.
 - 1. Where installation of one part of the Work depends on installation of other components, either before or after its own installation, schedule construction operations in the sequence required to obtain the best results.
 - 2. Where availability of space is limited coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
 - 3. Make provisions to accommodate items scheduled for later installation.
 - 4. The General Contractor shall as part of his work provide for all cutting, patching and drilling, not specified to be the work of others.
- B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

- 1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of schedules.
 - 2. Installation and removal of temporary facilities.
 - 3. Delivery and processing of submittals.
 - 4. Progress meetings.
 - 5. Project closeout activities.
- D. Conservation: Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare coordination Drawings where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.
 - 1. Show the relationship of components shown on separate Shop Drawings.
 - 2. Indicate required installation sequences.
 - 3. Comply with requirements contained in Section 01300 Submittals.
 - 4. Format to be as directed by the Architect.
- B. Staff Names: Within fifteen (15) days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers. Provide twenty-four (24) hour Emergency telephone numbers listed separately.
 - 1. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.
 - 2. The Contractor shall provide a copy of the list, and updates as its changes, to the Worcester Police Department and other City Departments as directed by the Architect.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Manufacturer's Instructions: Comply with manufacturer's written instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent the requirements contained in Contract Documents.
- C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
- D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.
- E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.
- F. Re-check measurements and dimensions, before starting each installation.
- G. Install each component during weather conditions that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
- H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
- I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decision to the Architect for final decision.

3.2 CLEANING AND PROTECTION

- A. During handling and installation clean and protect construction in progress and adjoining materials in place. Apply protective covering where required and as necessary to assure protection from damage or deterioration.
- B. Clean and maintain all completed construction as frequently as necessary through the remainder of the construction period.
- C. 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. Where applicable, such exposures include, but are not limited to, the following:
 - 1. Excessive vibration.
 - 2. Excessive static or dynamic loading.
 - 3. Excessive internal or external pressures.

- 4. Excessively high or low temperatures.
- 5. Thermal shock.
- 6. Excessively high or low humidity.
- 7. Air contamination or pollution.
- 8. Air borne debris/dust or construction particulates.
- 9. Water or ice.
- 10. Solvents.
- 11. Chemicals.
- 12. Light.
- 13. Puncture.
- 14. Abrasion.
- 15. Heavy traffic.
- 16. Soiling, staining, and corrosion.
- 17. Bacteria.
- 18. Rodent and insect infestation.
- 19. Combustion.
- 20. Electrical current.
- 21. High-speed operation.
- 22. Improper lubrication.
- 23. Unusual wear or other misuse.
- 24. Contact between incompatible materials.
- 25. Destructive testing.
- 26. Misalignment.
- 27. Excessive weathering.
- 28. Unprotected storage.
- 29. Improper shipping or handling.
- 30. Theft.
- 31. Vandalism.

END OF SECTION 013100

SECTION 013300 – SUBMITTAL PROCEDURES

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.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including:
 - 1. Contractor's 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. Coordination Drawings.
 - 11. Quality assurance submittals.
 - 12. Submittal of three (3) sets of 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.
- 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 SUBMITTAL PROCEDURES/SHOP DRAWINGS

- A. Submittal procedures shall be electronic for all submittals for approval and distribution unless otherwise noted. Provide to the owner one copy of all approved submittals in an organized manner with a submittal log. All color samples must be distributed as hard copies, and also electronically filed in order to track. Electronic files shall be clean, clear and readable. Plan files to be PDF and/or autoCAD and be to scale as appropriate. Contractor to transmit and update each submittal and process electronically, maintain a log that is distributed and updated weekly. All e-mails to clearly identify the submittal number and shall include the log, Or the contactor to maintain a web based system used for submittals, and the construction process.
- B. Distribution: Distribution of submittals shall be distributed as follows unless otherwise noted:
 - 1. Architect.
 - 2. Clerk of Works.
 - 3. Owner electronic and paper copy.
 - 4. A minimum of Three (3) copies for the Contractor as necessary for distribution to subcontractors, suppliers, installers, manufacturers, fabricators, and any other applicable parties.
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
- D. 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 must be notified if any delays arise that will impact lead times.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that requires sequential activity.
 - 2. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
 - 3. To avoid the need to delay installation as a result of the time required to process submittals and to allow sufficient time for submittal review, all contractors' submittals shall be submitted for processing and have received final Architect's approval within 45 days from the date of Contract.
 - a. Allow ample time for initial review to achieve efficient construction sequencing. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals.
 - b. If an intermediate submittal is necessary, process the same as the initial submittal.
 - c. Allow ample time for reprocessing each submittal to achieve efficient construction sequencing.

- d. No extension of Contract Time will be authorized because of the contractor's failure to transmit submittals to the Architect for processing sufficiently in advance of the scheduled Work.
- E. Submittal Preparation: Place a permanent label or title block on each submittal for identification. 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.
- F. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect using a transmittal form. The Architect will not accept submittals received from sources other than the Contractor.
- G. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

1.4 CONTRACTOR'S PROGRESS SCHEDULE

- A. Bar (Gantt) Chart Schedule: Meeting the requirements of Section 00200 Paragraphs 4.10, 4.10.1, 8.2.3 through 8.2.9. Prepare a fully developed, horizontal bar type of chart titled: "Progress Schedule". A sample is attached at the end of this section, some requirements specified here are not shown in the sample.
- B. Time, the horizontal (x) axis in this schedule shall show the start of on site work through the Date of Substantial Completion, show the time for completion of punch list items, and show the time for general warranty and completion of commissioning.
- C. Provide a separate time bar for each line in the approved "Schedule of Values" with the incremental value of work in place for each month. Work Completed (in place) must be 99% of contract value to achieve Substantial Completion. Provide a continuous vertical line to identify the first working day of each month.

- D. At the bottom of the progress schedule provide:
 - 1. a first line showing the total value of the work planned to be completed (in place) for each month,
 - 2. a second line showing the cumulative total value of the work planned to be completed (in place) to date,
 - 3. a third line showing the actual total value of the work certified as completed (in place) on the Application and Certificate for Payment for the month, and
 - 4. a fourth line showing the actual total cumulative value of the work certified as completed (in place) on the Application and Certificate for payment to date.
 - 5. Refer to Division 1 Section 01027 "Applications for Payment" for cost reporting and payment procedures.
- E. Distribution: Following approval of the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to provide actual work in place and conform to schedule.
- F. Revisions: Revisions to values and or time shown in the Progress Schedule may only be made to reflect a Change Order and in accordance with Section 00200 Paragraph 8.2.7. When revisions are made, distribute to the same parties and post at the job-site. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- G. Progress Schedule Updating: Revise the schedule after each meeting, where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

REGIONAL EMERGENCY COMMUNICATIONS CENTER

| Progress Schedule (as required by Article 8, Paragraphs 8.2.3 & 8.2.4 of the General Conditions) | | | | | | | | | | |
|--|--|--------------|--------------------|-----------------------------|-------------------|-------------------------|--------------|--------------|--------------|-----------------|
| (Project) | Name) | | (Architect) (Date) | | | (Approved by Architect) | | | | |
| (City of V | Worcester Dept. or Facility) | | (Construction | on Manager) (Revision Date) | | | | | | |
| (Project | Address) | | (Contractor) | | (Revised Through) | | | | | |
| Section | Contras on Pilot Code Mid Contras | Mar-98 | Apr-98 | May-98 | Jun-98 | Jul-98 | Oct-98 | Nov-98 | Dec-98 | Tatala |
| Number | Section or Filed Sub-bid Section | I \$4,000 | 2 \$4,000 | 3 \$4,000 | 4 \$4,000 | 5 \$4,000 | 6 \$4,000 | 7 \$4,000 | 8 \$4,000 | Totals |
| 01000 | General Requirements | | | | | | | | | \$32,000 |
| 03000 | et | \$10,000 | \$10,000 | | | | | | \$10,000 | 630.000 |
| 02000 | Sitework | | \$4,000 | \$12,000 | | | \$8,000 | | | \$30,000 |
| 03000 | Concrete | | | | | | | | | \$24,000 |
| | | | | \$8,000 | \$10,000 | \$12,000 | | | | |
| 04000 | Masonry | | | \$20,000 | | | | | | \$30,000 |
| 05000 | Metals | | | | | | | | | \$20,000 |
| 05500 | Matel Pakalantiana | | | | | | | \$7,000 | | 67.000 |
| 05500 | Metal Fabrications | | | | | | | | \$4,000 | 57,000 |
| 06000 | Wood & Plastics | | | | | | | | | \$4,000 |
| | | | | | \$3,000 | | | | | CR A A A |
| 07100 | Waterproofing & Caulking | | | | | \$12,000 | | | | \$3,000 |
| 07600 | Roofing & Flashing | | | | | | | | | \$12,000 |
| | | | | | | | \$4,000 | | | |
| 08000 | Doors & Windows | | | | | | | \$8,000 | | \$4,000 |
| 08520 | Alum. Windows | | | | | | | | | \$8,000 |
| | | | | | | | | | \$1,000 | |
| 08800 | Glass & Glazing | | | | | | \$6.000 | \$5,000 | | \$1,000 |
| 09250 | Gypsum Drywall | | | | | | 30,000 | 35,000 | | \$11,000 |
| | | | | | | | | \$2,000 | | |
| 09310 | Ceramic Tile | | | | | | | \$1,000 | \$1.000 | \$2,000 |
| 09511 | Accoustical Ceilings | | | | | | | 31,000 | 51,000 | \$2,000 |
| | | | | | | | | | \$3,000 | |
| 09650 | Resilient Flooring | | | | | | | | \$2.000 | \$3,000 |
| 09900 | Painting | | | | | | | | 32,000 | \$2,000 |
| | | | | | | | | | \$14,000 | |
| 10000 | Specialties | | | | | | \$8.000 | \$8.000 | \$\$ 000 | \$14,000 |
| 14204 | Hydraulic Elevators | | | | | | 30,000 | 30,000 | 30,000 | \$24,000 |
| | | | | \$1,000 | \$2,000 | | | \$3,000 | \$5,000 | |
| 15400 | Plumbing | | | | | \$4.000 | \$5.000 | | \$4.000 | \$11,000 |
| 15600 | HVAC | | | | | 34,000 | 33,000 | | 34,000 | \$13,000 |
| 16000 | Floatnical | | | \$1,000 | \$3,000 | | | \$4,000 | \$4,000 | \$12.000 |
| 10000 | Total Planned to be Completed | | | | | | | | | 512,000 |
| | This Month | \$14,000 | \$18,000 | \$46,000 | \$22,000 | \$32,000 | \$35,000 | \$42,000 | \$60,000 | |
| | Total planned to be Completed To Date | \$14,000 | \$32,000 | \$78,000 | \$100,000 | \$132,000 | \$167,000 | \$209,000 | \$269,000 | \$269,000 |
| | Actual Total Completed This Month | \$11,000 | \$22,000 | \$38,000 | | | | | | |
| | Actual Total Completed To Dete | | | | | | | | | |
| | Actual Total Completed To Date | \$11,000 | \$33,000 | \$71,000 | \$71,000 | \$71,000 | \$71,000 | \$71,000 | \$71,000 | \$470,000 |

1.5 SUBMITTAL SCHEDULE

A. After development and acceptance of the Contractor's Progress Schedule, prepare a complete Submittal Schedule and promptly submit the schedule to the Architect.

- B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with submittal dates.
- C. Submittal Schedule Updating: Revise the Submittal Schedule after each meeting or activity where revisions have been recognized or made. Issue the updated project schedule concurrently with each Application for Payment.

1.6 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report recording the following information concerning events at the site, and submit copies to the Architect and Clerk of Works at weekly intervals:
 - 1. List of subcontractors at the site.
 - 2. Count of personnel at the site.
 - 3. Accidents and unusual events.
 - 4. Meetings and significant decisions.
 - 5. Stoppages, delays, shortages, and losses.
 - 6. Emergency procedures.
 - 7. Services connected, disconnected.
 - 8. Equipment or system tests and startups.
 - 9. General daily work tasks and progress.

1.7 SHOP DRAWINGS

- 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 <u>do not constitute an acceptable or valid request for substitution</u>, <u>nor do they constitute approval</u>.
- B. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.
- C. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:
 - 1. Dimensions.
 - 2. Identification of products and materials included by sheet and detail number.
 - 3. Compliance with specified standards.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement.

1.8 PRODUCT DATA

- 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 <u>do not constitute an acceptable or valid request for substitution</u>, <u>nor do they constitute approval</u>.
- B. 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.
- C. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
- D. Unless non-compliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
- E. 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. 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 <u>do not constitute an acceptable or valid request for substitution</u>, <u>nor do they constitute approval</u>.
- B. 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.
- C. 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.
- D. 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.
- E. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit three (3) 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.
- F. 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 ARCHITECT'S ACTION

- A. Except for submittals of record or information, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return as noted in Paragraph 1.3A.
- B. Compliance with specified characteristics is the Contractor's responsibility.
- C. Action Stamp: The Architect will stamp each submittal with a uniform, selfexplanatory action stamp. The Architect will mark the stamp appropriately to indicate the action taken:
- D. Final Unrestricted Release: When submittals are marked "Approved", the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend on that compliance.
 - 1. Final-But-Restricted Release: When submittals are marked "Approved as Noted", that Work covered by the submittal may proceed provided it complies with markings or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
 - 2. Returned for Resubmittal: When submittal is marked "Approved as Noted -Revise and Resubmit" or "Not Approved, Revise and Resubmit", do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the markings and resubmit without delay. Repeat if necessary to obtain different action mark.
- E. The Contractor shall not use, or permit to be used submittals marked "Approved as Noted Revise and Resubmit" or "Not Approved, Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.
- F. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned marked "Action Not Required".

1.12 DRAWINGS TO BUILDING DEPARTMENT

- A. Contractor shall submit three (3) sets of fully addenderized 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 Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013000

SECTION 014000 - QUALITY REQUIREMENTS

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 a part of this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Quality-Control Services.
- B. Quality-Control Services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
- D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
 - 1. Specific 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 inspections, tests, and related actions do not limit Contractor's qualitycontrol procedures that facilitate compliance with Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 RESPONSIBILITIES

- A. Contractor Responsibilities: The Contractor shall provide inspections, tests, and other similar Quality-Control Services specified in individual Specification Sections and as required by governing authorities. Costs for these services are included in the Contract Sum.
 - 1. The Contractor shall employ and pay a qualified independent testing agency to perform specified Quality-Control Services.
 - 2. Where the Owner has engaged an independent testing agency for testing and inspecting part of the Work, and the Contractor is also required to engage a testing entity for the same or related part or element of the Work, the Contractor

shall not employ the entity engaged by the Owner, unless agreed to in writing by the Owner.

- 3. Re-testing: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.
 - a. The cost of re-testing construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction.
- 4. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
 - a. Provide access to the Work and furnish incidental labor, facilities and equipment necessary to facilitate inspections and tests.
 - b. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
 - c. Provide facilities for storage and curing of test samples.
 - d. Provide security and protection of samples and test equipment at the Project Site.
- B. Owner Responsibilities: The Owner will engage and pay for the services of an independent testing agency to perform inspections, tests or other Quality-Control Services specified to be performed by independent testing agencies and not specified as the responsibility of the Contractor and/or are provided for by another identified entity. Costs for these services are not included in the Contract Sum.
 - 1. The Owner shall employ and pay for the services of a qualified independent testing agency, testing laboratory or other qualified entity to perform Quality-Control Services, which are the Owner's responsibility.
- C. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
 - 1. The agency shall notify the Architect and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
 - 3. The agency shall not perform any duties of the Contractor.

- D. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
 - 1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.4 SUBMITTALS

- A. Unless the Contractor is responsible for this service, the independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.
 - 1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
 - 2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making the inspection or test.
 - f. Designation of the Work and test method.
 - g. Identification of product and Specification Section.
 - h. Complete inspection or test data.
 - i. Test results and an interpretation of test results.
 - j. Ambient conditions at the time of sample taking and testing.
 - k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
 - 1. Name and signature of laboratory inspector.
 - m. Recommendations on retesting.

1.5 QUALITY ASSURANCE

- A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.
 - 1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State of Massachusetts.

1.6 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 (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes.
- B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.
- C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

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 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. Indicated: The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. There is no limitation on location.
- C. Directed: Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the Architect, requested by the Architect, and similar phrases.
- D. Approved: The term approved, when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.
- E. Regulations: The term regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. Furnish: The term furnish means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations to the location within the project where the product will finally be installed.
- G. Install: The term install describes operations at the Project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. Provide: The term provide means to furnish and install, complete and ready for the intended use.
- I. 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.
- J. Project site is the space available to the Contractor for performing construction activities either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is located.
- K. 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.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16 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.
 - a. The words "shall be" are implied wherever a colon (:) is used within a sentence or phrase.

1.4 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 for a decision before proceeding.
 - 1. 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.
- D. 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. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.
- E. 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.

F. 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 Ass 1540 E. Dundee Road, Suite 310 | ociation |
| | 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 Laborato 1629 K St., NW Washington, DC 20006 | ories (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 Assoc 1101 Connecticut Ave., NW, Suite 700 | iation |
| | Washington, DC 20036 | (202) 429-5155 |

| AGA | American Gas Association 1515 Wilson Blvd. | (703) 041 0400 |
|--------|---|----------------|
| | 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 Manufacture 20 North Wacker Drive | ers |
| | 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 | |
| | Tacoma, WA 98411 | (206) 565-6600 |
| API | American Petroleum Institute | |
| | Washington, DC 20005 | (202) 682-8000 |
| ARI | Air Conditioning and Refrigeration Institute | |
| | 1501 Wilson Blvd., 6th Floor | (702) 524 9900 |
| | Ariington, VA 22209 | (703) 524-8800 |
| ARMA | Asphalt Roofing Manufacturers Association | |
| | 0200 Montrose Rd. Rockville MD 20852 | (301) 231-9050 |
| | | |
| ASA | Acoustical Society of America | |
| | 500 Sunnyside Blvd. Woodbury NY 11797 | (516) 349-7800 |
| | woodbary, wi mini | (310) 349-7000 |
| ASC | Adhesive and Sealant Council | |
| | 1627 K Street, NW, Suite 1000 Washington, DC 20006 1707 | (202) 452 1500 |
| | Washington, DC 20000-1707 | (202) 432-1300 |
| ASHRAE | American Society of Heating, Refrigerating | |
| | and Air-Conditioning Engineers | |
| | Atlanta, GA 30329 | (404) 636-8400 |
| | Attanua, 611 50525 | |
| ASME | American Society of Mechanical Engineers | |
| | 545 East 47th St. New York, NV 10017 | (212) 705 7722 |
| | new fork, inf 1001/ | (212) /03-//22 |
| 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 1200 G Street, NW, Suite 500 | (202) 628-6380 |
| | Washington, DC 20005 | |
| AWCMA | American Window Covering Manufacturers | Association |
| | 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 EL 33135 | (305) 113-0353 |
| | Wiaiii, FL 33133 | (303) 443-3333 |
| AWWA | American Water Works Association | |
| | Denver, CO 80235 | (303) 794-7711 |
| BHMA | Builders' Hardware Manufacturers Associati | on |
| | 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 10026 | (212) 592 (894 |
| СВМ | New York, NY 10036 Certified Ballast Manufacturers Association Hanna Building, No. 772 | (212) 582-6884 |
| | 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 A 5700 Old Orchard Road, 1st Floor Skokie, IL 60077 | Association (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 Associati 2759 State Road 580, Suite 112 Clearwater, FL 34621 | on (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 | |
| | 1 nomas Associates, inc. 1300 Sumper Avenue | |
| | Cleveland, OH 44115-2851 | (216) 241-7333 |
| HI | Hydronics Institute | |
| | P.O. Box 218 | |
| | 35 Russo Place | (0.00) 4(4.0200 |
| | 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 II 60654 | (212) 647 1050 |
| | Cmicago, 11 00054 | (312) 647-1950 |
| ICEA | Insulated Cable Engineers Association, Inc. | |
| | South Varmouth MA 02664 | (508) 394-4424 |
| | | (300) 374-4424 |
| IEC | International Electrotechnical Commission | |
| | (Available from ANOI) 1/30 Broodway | |
| | New York, NY 10018 | (212) 354-3300 |
| | | (=1=) 007-0000 |
| IEEE | Institute of Electrical and Electronic Enginee 345 East 47th Street | ers |
| | New York, NY 10017 | (212) 705-7900 |
| | - , | |

| IESNA | ESNA 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 (7 Alexander Drive | |
| | Research Triangle Park, NC 27709 | (919) 549-8411 |
| КСМА | 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 Amer | ica |
| | 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 A | ssociation |
| | 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 7010 Woodmont Avenue, Suite 800 | |
| | Bethesda, MD 20814 | (301) 657-2652 |
| NCSPA | National 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 | (201) (27 2110 |
| | Betnesda, MD 20814 | (301) 057-3110 |
| NEMA | National Electrical Manufacturers Associatio 2101 L Street, NW, Suite 300 |)n (202) 457 8400 |
| | wasnington, 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 Asso P.O. Box 3009 Memphis. TN 38173-0009 | ciation (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 Associa (Now NWWDA) | ation |
| NWWDA | National Wood Window and Door Associati 1400 East Touhy Avenue, #G54 Des Plaines, IL 60018 | on (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 (Now HMA) | Association |
| SIGMA | Sealed Insulating Glass Manufacturers Assoc 401 North Michigan Avenue | iation |
| | 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 A P.O. Box 298 Winnetka, IL 60093 | ssociation (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 Associatio 600 South Federal Street, Suite 400 Chicago, IL 60605 | n (312) 922-6222 |
| TIMA | Thermal Insulation Manufacturers Associa 29 Bank Street Stamford, CT 06901 (Standards now issued by NAIMA) | ation (203) 324-7533 |
| 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, perf the Chicago area. Address and telephone number not confirmed.) | iaps to | |
| 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 | | |
| | Hillside, IL 60162 | (708) 449-2933 | |
| WLPDIA | Western Lath, Plaster, Drywall Industries A (Formerly California Lath & Plaster Associ 8635 Navaio Road | Drywall Industries Association Lath & Plaster Association) | |
| | San Diego, CA 92119 | (619) 466-9070 | |
| WWPA | Western Wood Products Association Yeon Building | | |
| | 522 SW 5th Avenue Bortland OB 97204 2122 | (503) 224 2020 | |
| | 1 01 uallu, OK 71204-2122 | (303) 224-3930 | |
| W.W.P.A. | Woven Wire Products Association 2515 North Nordica Avenue | | |
| | Chicago, IL 60635 | (312) 637-1359 | |

G. Federal Government Agencies: Names and titles of federal government standard or Specification-producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard or Specification-producing agencies of the federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up to date as of the date of the Contract Documents.

CE Corps of Engineers

| | (U.S. Department of the Army) Chief of Engineers – Referral Washington, DC 20314 | (202) 272-0660 |
|------|---|---------------------------------------|
| CFR | Code of Federal Regulations (Available from the Government Printing O North Capitol Street between G and H Stree Washington, DC 20402 | office) ets, NW |
| | (Material is usually first published in the ''F | Federal Register'') (202) 783-3238 |
| CPSC | Consumer Product Safety Commission 5401 Westbard Avenue | |
| | Bethesda, MD 20207 | (301) 492-6580 (800) 638-2772 |
| CS | Commercial Standard (U.S. Department of Commerce) Washington, DC 20230 | (202) 482-2000 |
| DOC | U.S. Department of Commerce 14th Street and Constitution Avenue, NW Washington, DC 20230 | (202) 482-2000 |
| DOT | Department of Transportation 400 Seventh Street, SW Washington, DC 20590 | (202) 366-4000 |
| EPA | Environmental Protection Agency 401 M Street, SW Washington, DC 20460 | (202) 382-2090 |
| FAA | Federal Aviation Administration (U.S. Department of Transportation) 800 Independence Avenue, SW Washington, DC 20590 | (202) 366-4000 |
| FCC | Federal Communications Commission 1919 M Street, NW Washington, DC 20554 | (202) 632-7000 |
| FHA | Federal Housing Administration (U.S. Department of Housing and Urban De Director, Manufactured Housing and Const Standards Division 451 Seventh Street, SW, Room 9158 | evelopment) cruction |
| FS | Washington, DC 20201 Federal Specification (from GSA) | (202) 755-5210 |

| | Specifications Unit (WFSIS) | | |
|--|---|----------------|--|
| | 7th and D Streets, SW | | |
| | Washington, DC 20407 | (202) 708-9205 | |
| GSA | General Services Administration | | |
| | F and 18th Streets, NW | | |
| | Washington, DC 20405 | (202) 708-5082 | |
| MIL | Military Standardization Documents | | |
| | (U.S. Department of Defense) | | |
| | Naval Publications and Forms Center | | |
| | 5801 Tabor Avenue | | |
| | Philadelphia, PA 19120 | | |
| NIST | National Institute of Standards and Technol | and Technology | |
| | (U.S. Department of Commerce) | | |
| | Gaithersburg, MD 20899 | (301) 975-2000 | |
| OSHA Occupational Safety and Health Administrati | | ation | |
| | (U.S. Department of Labor) | | |
| | N3647 | | |
| | 200 Constitution Avenue, NW | | |
| | Washington, DC 20210 | (202) 219-8148 | |
| PS | Product Standard of NBS | | |
| | (U.S. Department of Commerce) | | |
| | Washington, DC 20230 | (202) 482-2000 | |
| REA | Rural Electrification Administration | | |
| | (U.S. Department of Agriculture) | | |
| | 14th Street and Independence Avenue, SW | | |
| | Washington, DC 20250 | (202) 447-2791 | |
| USDA | U.S. Department of Agriculture | | |
| | 14th Street and Independence Avenue, SW | | |
| | Washington, DC 20250 | (202) 447-2791 | |
| USPS | U.S. Postal Service | | |
| | 475 L'Enfant Plaza, SW | | |
| | Washington, DC 20260-0010 | (202) 268-2000 | |
| | | | |

1.5 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.

1.6 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit 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 015000 - TEMPORARY FACILITIES AND CONTROLS

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 a part of this Section.

1.2 SUMMARY

- A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.
- B. Temporary utilities required include, but are not limited to:
 - 1. Temporary power and lighting as specified in Division 260000.
 - 2. Temporary heat & winter conditions.
- C. Temporary construction and support facilities required include, but are not limited to:
 - 1. Waste disposal services.
 - 2. Temporary yard and storage on and off-site.
 - 3. Construction aids and miscellaneous services and facilities.
 - 4. Sweeping compound.
 - 5. Emergency portable generators of size required, if permanent power is temporarily unavailable.
 - 6. Water service and distribution, if water supply to adjacent occupied spaces is temporarily unavailable.
 - 7. Parking
- D. Security and protection facilities required include, but are not limited to:
 - 1. Temporary weather protection, enclosures, and covers.
 - 2. Temporary fire protection and fire watch if required by Worcester Fire Department.
 - 3. Barricades, warning signs, lights.
 - 4. Temporary partitions between occupied areas and construction areas, STC 48 or better.
- E. Where a distinction is made in this specification section between temporary services to be provided by a General Contractor and those to be provided by a Subcontractor, the purpose is only to clarify which costs are to be included by the applicable parties for inclusion in the applicable bids and contracts that would follow. These distinctions have no bearing upon the Contract between the Owner and General Contractor and do not limit in any way the General Contractor's responsibility to provide all such temporary services without additional cost to the Owner. For the sake of clarity in this specification section, the term General Contractor has been

used for the person called the Contractor in other specification sections, when the intent is that that person shall provide a service directly at his own expense rather than at the expense of one of the Subcontractors from whom the Owner has taken filed sub-bids.

- F. The temporary services describes in this specification section may not be adequate to provide for all of the needs of the General Contractor or all Subcontractors, but are intended only to provide a basis for obtaining filed sub-bids. The General Contractor or any Subcontractor requiring additional temporary services for the proper execution of his work or because of climatic conditions shall arrange for and obtain such services at his own expense without further compensation by the Owner.
- G. The Contractor shall be responsible for restoring all landscaped areas affected by the work of this project to their original "like-new" state that existed prior to work commencing. This restoration work shall include, but not be limited to, planting beds with mulch, trees, shrubs, and lawn areas. Great care should be taken during the course of the work to not damage nor destroy any landscaping impacted by this work. Any landscaping disturbed, damaged, or destroyed shall be restored, repaired, or replaced in-kind at no cost to the Owner.

1.3 SUBMITTALS

A. Schedule: Submit a schedule indicating implementation and termination of each temporary utility within fifteen (15) days of date established for Commencement of the Work.

1.4 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:
 - 1. Commonwealth of Massachusetts State Building Code requirements; 6th Edition.
 - 2. Federal, State and City Health and safety regulations.
 - 3. Utility company regulations.
 - 4. Police, Fire Department and Rescue Squad rules.
 - 5. Environmental protection regulations.
- B. Standards: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:
 - 1. NFPA Code 241.
 - 2. NFPA 70.
 - 3. ANSI A10.
 - 4. NECA NJG-6.
- C. Electric Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70.
- D. Inspections: Arrange for authorities having jurisdiction to inspect and test temporary utilities prior to use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change from use of temporary service to use of permanent service.
- B. Conditions of Use: Maintain temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload temporary facilities, or permit them to interfere with progress. Do not allow hazardous, dangerous, unsanitary conditions, or public nuisances to develop or persist on the site.
- C. Maintain the continuity of all utility services at all times across all Phases of the Construction Project, unless otherwise directed by the Architect or Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials suitable for the use intended, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

2.2 TEMPORARY WATER

- A. Definitions:
 - 1. Water Access Point: A point, within the Project area, at which water is available during construction.
- B. Charges: The General Contractor shall pay for all facilities to provide water during construction, while the Owner will supply and pay for water during the construction. The General Contractors shall pay for backflow preventer if utilizing Owners Hydrant for water.
 - 1. The furnishing of water by the Owner shall be conditional upon all contractors being conservative and prudent in its use. In the event of any contractor is repeatedly wasteful in the use of water thus provided, the Owner reserves the right to charge the General Contractor for wasteful usage at an equitable rate for the additional portion of water used.
- C. Temporary Water: The General Contractor shall be responsible for all facilities to provide water during construction as defined above and further specified as follows:
 - 1. Except under unusual circumstances, when otherwise specified or approved by the Architect, all water shall be of potable quality.
 - 2. The General Contractor shall provide all necessary piping, valving, hose bibbs, hosing, etc. to provide temporary water during construction from a water access point determined by the Owner's Representative. Any facilities running within the building are required not to leak. Any damage incurred due to leaks shall be repaired at the expense of the General Contractor.

3. The General Contractor shall pay for and be responsible for the protection of Temporary Water, which he installs, from freezing and other damage.

2.3 TEMPORARY HEAT

- A. Definitions:
 - 1. Temporary Heating & Ventilating: The General Contractor shall provide temporary heat and ventilation, as needed, to work areas outside the building to maintain minimum temperatures described below. The General Contractor shall also provide temporary heat and ventilation, as needed, to work areas inside the building to maintain an indoor temperature of 68 degrees Fahrenheit during the winter months and 75 degrees Fahrenheit during the summer months.
- B. Charges: The General Contractor shall pay for all temporary heat and ventilation as defined above. The General Contractor shall pay for all fuel required for Temporary Heat and Ventilation. The Owner shall pay for all electrical energy use charges.
 - 1. The furnishing of electrical energy by the Owner shall be conditional upon being conservative and prudent in its use. In the event that any contractor is repeatedly wasteful in the use of electrical energy thus provided, the Owner reserves the right to charge the General Contractor at an equitable rate for the additional portion of electrical energy used.
- C. Temporary Heating: Portable heating units shall be of sufficient capacity and number and shall be located so that damage to any part of the project from low temperature will be prevented and that concrete, masonry, and other components requiring curing shall be properly cured.
 - 1. Heaters for temporary heat shall be temporary steam generators, forced air heaters, or other type heaters located outside the building or vented to the outside of the building. Type(s) shall be such as to not damage or stain construction or any part of the existing building. Heaters must be UL approved.
 - 2. At no time will oil-burning "salamander" type heaters be used, nor will nonvented, open flame heaters be used inside the building.
 - 3. Propane-type heaters shall not be used at anytime within the area of the building or near stockpiles of combustible materials.
 - 4. Temporary heating shall apply to winter conditions.
- D. Temporary Ventilation: Portable ventilation units shall be of sufficient capacity and number and shall be located so that damage to any part of the project from excess humidity will be prevented and that concrete, masonry, and other components requiring curing shall be properly cured.

2.4 TEMPORARY POWER AND LIGHTING

A. Definitions:

1. Temporary Electric: The furnishing, installing, maintenance, and removal of all wiring, fusing, switches, outlets, lamps, and accessory electrical devices required

to provide lighting and power needed by all construction trades for the duration of construction.

- B. Charges: The General Contractor shall pay for all facilities for Temporary Electric. The Owner shall pay for all use charges for electrical energy.
 - 1. The furnishing of electrical energy by the Owner shall be conditional upon all contractors being conservative and prudent in its use. In the event that any contractor is repeatedly wasteful in the use of electrical energy thus provided, the Owner reserves the right to charge the General Contractor at an equitable rate for the additional portion of energy consumed.
- C. Temporary Electricity: The General Contractor shall pay for and be responsible for Temporary Electric as defined above and further specified as follows:
 - 1. The General Contractor shall provide temporary electricity during construction from an electrical service access point determined by the Owner's Representative.
 - 2. The Temporary Electricity is expected to be used during normal working hours, as defined in Section 01010 Summary of Work. No additional charge shall be made by the General Contractor for switching the system on and off to meet this time requirement.
 - 3. Responsibility of compliance with local, state, and national codes for installation of the Temporary Electric service shall be borne by the General Contractor.
 - 4. The General Contractor shall be responsible to service and maintain all temporary lighting during the construction.
 - 5. The General Contractor shall be responsible to pay for the following Temporary Electricity. This schedule will not necessarily provide for all requirements of all contractors. The General Contractor or any Subcontractor having requirements for power, lighting, or service other than those provided herein, shall make the necessary arrangements to obtain such power, lighting, or service at his own expense.
 - a. The General Contractor shall obtain all necessary permits, shall furnish and install the temporary electrical power and lighting systems, and shall pay for all labor, materials, and equipment required for this work. All such temporary electrical work shall meet the requirements of the Massachusetts Electrical Code and OSHA.
 - b. The Electrical Subcontractor shall furnish and install a feeder, or feeders, of sufficient capacity to provide additional lighting to the work areas, as required, to properly carryout the work. Temporary lighting shall be based on the following requirements:
 - 1) Rooms or spaces under 250 square feet: Two (2) 100-watt lamps.
 - Rooms or spaces over 250 square feet and under 500 square feet: Four (4) 100-watt lamps.
 - 3) Rooms or spaces over 500 square feet and under 1,000 square feet: Two(2) 200-watt lamps.
 - 4) Rooms or spaces over 1,000 square feet: Two (2) 200-watt lamps for every 1,000 square feet or fraction thereof.
 - 5) Sufficient additional wiring outlets and lamps shall be installed to insure proper lighting in stairwells, corridors, and passage areas.

- 6) Temporary power, in addition to the lighting requirements, shall be provided throughout the building for electrically operated tools, based on a minimum of 0.50 watts per square foot.
- 7) Outlets shall be located at convenient points so that extension cords of not over 50 feet in length will reach all work requiring light or power.
- 8) All Electrical Outlets shall be properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light, for connection of power tools and equipment.
- 9) All Electrical Power Cords shall be grounded extension cords that are "hard-service" type where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
- c. All necessary cables, load centers, switches, and accessories required for the temporary light and power installation shall be provided and installed by the General Contractor.
- d. The General Contractor shall furnish and install all lamps, both initial and replacement until the Date of Substantial Completion.
- e. Temporary light and power requirements herein required are for the use of all trades working at the site.
- f. All Contractors and Subcontractors shall, individually, furnish all extension cords and lamps, sockets, motors, and accessories required for their work.
 - 1) All Electrical Power Cords shall be grounded extension cords that are "hard-service" type where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
- g. Any of the Contractors or Subcontractors shall reimburse the General Contractor for any of the following:
 - 1) Any temporary wiring of a special nature, other than that specified above, required for their work.
 - 2) Any temporary wiring of construction offices and buildings used by them.
 - 3) Any temporary wiring for protective night lighting.
- h. The General Contractor shall be responsible for removing all temporary wiring, service equipment, and accessories when and as directed to by the General Contractor.
- i. The provisions of the Massachusetts Electrical Code shall be strictly complied to, with special respect to Article 305 of said code, and the following precautions shall be taken:
 - Open conductors shall be fastened at the ceiling height at minimum of 10 feet intervals. Conductors may not be laid on the floor, and receptacles or fixed equipment circuits shall contain a separate equipment-grounding conductor if run as open wiring. Receptacles shall be of the grounding type. Branch circuits shall also be of the grounding type, unless installed in a complete metallic conductor and receptacles electrically connected to the grounding conductor. Neither bare conductors nor earth returns

shall be used for wiring of any temporary circuits. Grounding circuits shall never be interrupted.

- 2) All 15 and 20 amp receptacle outlets on single phase circuits which are used for construction purposes shall be equipped with ground-fault circuit interrupters, reset button, and pilot lights; as required by Article 210 of the Massachusetts Electrical Code.
- 3) All outlets shall be properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets.

2.5 TEMPORARY SANITARY FACILTIES

- 1. The General Contractor shall provide ample toilet facilities with proper enclosures for the use of workmen employed on the work to be as located within the construction areas on site where permitted by the Architect.
 - a. Provide the Architect with a schedule of maintenance and cleaning. Provide toilet facilities with hand washing sanitizer dispenser, paper towels, and cleaners.
 - b. Toilet facilities shall be installed and maintained in conformity with the governing laws and building code. They shall be properly lit, ventilated, and kept clean at all times.
 - c. At no time shall any Contractor Personnel use toilet facilities outside the work areas or in any Owner occupied parts of the building.

2.6 TEMPORARY WEATHER PROTECTION

- A. Definitions:
 - 1. Weather Protection: The furnishing, installing, maintenance, and removal of temporary closures, covers, shields, and any other weather protection devices as required to protect work in place and permit construction to proceed during cold or inclement weather.
- B. Weather Protection Standard: The following weather protection standards pursuant to Chapter 597 of the Acts of 1980, modifying Sections 44F and G of Chapter 149 of the General Laws, are hereby incorporated into this specification, and shall be considered supplementary to the temporary heating and temporary enclosure requirements. Under the provisions of Chapter 149, Section 44F(I) and Section 44G, Paragraph D, of the General Laws, General Contractors are required to provide weather protection to allow building construction to be carried on during the months of November through March. These standards do not require enclosures for heat for operations that are not economically feasible to protect in the judgment of the Awarding Authority; including for example, site work, excavation, pile driving, steel erection, erection of certain exterior panels, roofing, and the like.
 - 1. The General Contractor shall provide and install weather protection.
 - 2. Weather protection shall be provided during the months of November through March.

- Temperature at the working surface shall be at least forty degrees Fahrenheit (40° F). This provision does not supercede any specific greater requirements for the methods of construction or curing of materials.
- 4. Weather protection materials, equipment, and the installation thereof, shall comply with all safety rules and regulations including the provisions for adequate ventilation and fire protection devices.
- 5. At completion of work, the General Contractor shall remove temporary weather protection and restore all surfaces to first class condition.
- 6. The General Contractor may choose, if the Awarding Authority approves, to use the permanent heating system for temporary heat after the building is enclosed and the system has been tested and is ready to operate.
 - a. The General Contractor shall thoroughly clean and restore to first class condition, acceptable to the Awarding Authority, all portions of the permanent heating system that are used for heating during construction.
 - b. Use of the permanent heating system for weather protection shall not affect any heating system guarantee that may be due to the Awarding Authority; such guarantee shall begin to run only when the Awarding Authority accepts the building.
- 7. Reporting Requirements:
 - a. Within thirty (30) calendar days after Contract Award the General Contractor shall submit, in writing to the Awarding Authority for approval, its proposed plan for weather protection. Refer to Section 01300 Submittals for additional information regarding the appropriate procedure in preparing this submittal.
 - b. The General Contractor shall furnish and install accurate Fahrenheit thermometers at places designated by the Awarding Authority to determine whether the required temperature is being maintained.
- C. Temporary Covers and Enclosures:
 - 1. Except as otherwise specified herein below, all costs of closing openings in new construction and the exterior of the existing buildings where opened to the weather, including temporary covers and enclosures, shall be borne by the General Contractor. Enclosures must be built around various portions of the new construction and new exterior openings in the existing building as the work progresses if, and as necessary to totally insure against the intrusion of rain, snow, and other moisture which might damage the new or existing materials or finishes and as necessary to maintain the minimum temperatures specified.
 - a. Where roofs, exterior walls, windows, or other elements of new or existing buildings or structures providing weather protection are to be temporarily opened to the weather, they shall be fully enclosed or covered with securely attached and well draining enclosures whenever inclement weather is occurring or is threatening, to assure absolute weather protection. Any and all damage to the new or existing buildings or structures, including all materials and finishes thereon, caused by inadequate protection shall be made good by the General Contractor without further cost to the Owner.
 - 2. All such weather tight enclosures shall provide a reasonable open area to permit drying of new wet materials while at the same time making it possible to maintain the required interior temperatures. The General Contractor shall provide sufficient continuous ventilation until the time that the "wet" work of the

project has dried sufficiently to receive finished woodwork and other materials subject to moisture damage, at which time the ventilation shall be maintained at approximately the anticipated conditions of final use of the project.

- 3. The permanent doors and frames shall not be used as temporary enclosures prior to the time of delivery of finished woodwork or acoustical materials. Temporary wood or plywood doors with wood frames and proper hardware to make the doors self-closing shall be provided, instead, at the door openings.
- 4. As parts of the temporary enclosures, the permanent doors, windows, and fixed glass may be used, provided sufficient ventilation area is available and that extreme care is taken to prevent damage to the same. Where available ventilation area is limited, intake and discharge fans may be used to increase air movement through the construction areas. Before delivery of finished woodwork or other materials subject to moisture damage, the permanent windows, roof accessories, fixed glass, doors, and entrances must be in place. Spark-proof fans shall also be provided to remove toxic or obnoxious fumes from enclosed areas as may be required.
- 5. Once temporary enclosures are in place, a temperature of at least 55 degrees Fahrenheit shall be maintained within all interior workspaces. From time of delivery of first shipment of finished woodwork or other finished materials subject to moisture damage, a temperature of at least 60 degrees Fahrenheit shall be maintained within all interior spaces. Temperatures shall be maintained at this level until time of substantial completion of the project or occupancy by the Owner, whichever is sooner, and shall not be discontinued until definite arrangements for same have been made by the Owner.
- D. Weather Protection by Subcontractors: The General Contractor shall provide at his own expense all Weather Protection as defined above except as follows:
 - 1. Each Subcontractor shall pay for and be responsible for the weather protection of his tools, devices, equipment, appliances, and appurtenances to used in the accomplishment of his work and for weather protection of materials furnished by him until such materials are incorporated as a physical part of the Project.
 - 2. Protection and heating of aggregates and water for concrete and mortars shall be the responsibility and at the expense of the respective Subcontractors furnishing concrete and mortars.
 - 3. Construction Water Facilities, furnished and installed by the General Contractor, shall be protected against freezing by the Contractor at his own expense.
 - 4. Hoses, piping, and accessory devices installed and connected by others to the water facilities furnished by the Contractor shall be protected against freezing by the installer at his own expense.

2.7 TEMPORARY FIRE PROTECTION

A. The General Contractor shall take all necessary precautions for the prevention of fire during construction. He shall be responsible that the area within the contract limits is kept orderly and clean and that combustible rubbish is promptly removed from the site. Combustible materials shall be stored on site in a manner and at locations approved by the Architect. The General Contractor shall comply with all suggestions regarding fire protection made by the Insurance Company with which the Owner maintains his fire insurance.

- B. The General Contractor shall provide and maintain in good working order, under all conditions, readily available to all portions of the site and work, suitable and adequate fire protection equipment and services. Such facilities shall include, but are not limited to, the furnishing and maintaining in good working order a minimum of two (2) standard, Underwriters' Laboratories labeled, 2-1/2 gallon capacity fire extinguishers per floor.
- C. Smoking shall be prohibited on the premises and signs to this effect shall be posted conspicuously.
- D. Fires shall not be built on the premises.

2.8 TEMPORARY CRANES, LIFTS, DERRICKS, AND HOISTING SERVICES

- A. The General Contractor shall furnish, install, operate, and maintain in safe condition all crane services outside of the building for his own use and for the use of all Subcontractors on the project to properly carry out and complete the work, except as may otherwise be specifically provided for in any of the trade sections of the Specifications.
- B. All crane services shall be provided at no cost to the Subcontractors for their work.
- C. Each Subcontractor shall, however, provide their own lifts, derricks, hoisting services, etc. (excluding crane services outside the building) for their own work outside and inside the building to properly complete their work.
- D. All cranes, lifts, derricks, and hoisting equipment, machinery, and operation shall comply in all respects to the governing laws and codes.

2.9 TEMPORARY STAGING AND SCAFFOLDING

- A. The General Contractor shall furnish, erect, and maintain in safe condition all exterior and interior staging and scaffolding required for his own use.
- B. Each of the Subcontractors shall furnish, erect, and maintain in safe condition all exterior and interior staging and scaffolding for their own use.
- C. All staging and scaffolding shall be enclosed at the ground by a temporary construction fence as defined elsewhere in this Section.
- D. Staging and scaffolding shall comply in all respects to the governing laws and codes.

2.10 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.

2.11 TEMPORARY STAIRS, LADDERS, RAMPS, PLATFORMS, ETC.

- A. The General Contractor shall provide and maintain all necessary temporary stairs, ladders, ramps, platforms, and other temporary construction required for the proper execution of the work, all of which shall comply with requirements of the governing laws and codes and/or as required by local building officials.
- B. As soon as the permanent ladders and hatches are installed, the General Contractor shall provide temporary protective measures acceptable to the Architect to maintain their new condition until substantial completion, so to assure that such items will not be damaged as the remaining work progresses.

2.12 TEMPORARY FENCING, BARRIERS, AND PARTITIONS

- A. Protection: The General Contractor shall be fully responsible for security of the work areas of the site and for patrolling and protecting the work under construction and his and the Owner's materials stored or otherwise located on the site.
- B. Temporary Barricading: In addition, the General Contractor shall provide other temporary fencing, barricading, and overhead protection of substantial nature to protect workmen, other personnel, and the public against various hazards and attendant nuisances that come about as the work progresses such as, but not necessarily limited to, falling materials, dangerous excavations, dangerous projections or obstructions, stored or stock piled materials, etc. Comply fully with recommendations of the Association of General Contractors and provisions of the governing laws and codes.

Note: As part of requirement for overhead protection, include substantial, well constructed, walkways covers sufficient to assure pedestrian safety, in accordance with recommendations of the Association of General Contractors and provisions of the governing laws and codes.

C. In addition, the General Contractor shall provide all necessary protective barriers within the existing building as required to assure the safety of persons and property wherever work of this Contract is being carried out. Include substantial, well constructed, protective barriers at all construction work-limit-lines separating Contract work areas from areas occupied by the Owner. Also include flameproof dust-curtaining and block or filter mechanical return air systems in a safe manner, in cooperation with Mechanical trade, between areas where dust effusive work is being carried out and other interior areas of the new addition and existing building to prevent passage of dirt and dust. Barriers, curtaining, etc., must be self-supporting, and must not depend on building construction for primary structure or anchorage. Locations and quantities of barriers and dust curtaining shall at all times be subject to Owner's and Architect's approval, but such approval, or lack of inspection or approval, by the Owner or the Architect, shall not be construed as relieving the Contractor of any of his responsibilities under the Contract.

2.13 TEMPORARY STORAGE FACILITIES

- A. Space for storage of materials shall be confined to the construction areas outside the building and as designated and/or approved by the Architect.
- B. Locations where construction equipment may be stored during non-working hours shall be as acceptable to the Owner. Construction equipment shall not present a hazard when stored.

2.14 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 General Contractor shall provide temporary partitions to prevent noise, dust, pollution or order from entering occupied spaces. Temporary partitions shall have STC of 50. Submit location plan and type of construction for temporary partitions for approval.
- C. Control of air borne dust or pollution from the site with spray or as otherwise may be necessary to prevent the migration of any dust or pollutants.
- D. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental protection regulations.
 - 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, or pollution.
 - 2. Vacuum equipment shall be equipped with HEPA filters.
 - 3. Vacuum carpeted areas.
 - 4. Wet mop floors to eliminate trackable dirt.
 - 5. Sweeping shall be allowed only with the use of a non-oil based sweeping compound followed by vacuuming any remaining residue.
 - 6. Wipe down walls and doors of demolition enclosure.
- E. Disposal: Remove and transport debris, in a manner that will prevent spillage on adjacent surfaces and areas, to the construction dumpster(s).
- F. Cleaning: Clean areas adjacent to the work area of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

2.15 WATER CONTROL

A. The General Contractor shall be responsible for site drainage and snow removal within the limit-of-work lines and shall maintain such drainage and removal during the life of the Contract in a manner approved by the Owner and Architect, and so as not to adversely affect the adjacent areas.

- B. Water from the Work of this Project shall be disposed of in such a manner as not to be a threat to public health nor cause damage to public or private property. It shall not be disposed of over surfaces of roads, walks, and streets, nor be permitted to cause any interference with the normal use of the same.
- C. Removal of snow and ice from within the limit-of-work lines at the site as required to maintain the continual progress of the work, including that required to keep work areas, access roads, and storage areas clear, free, and in use, and as required to prevent damage to existing construction and new work in places.

2.16 CONSTRUCTION CLEANING AND CONSTRUCTION DUMPSTERS

- A. The General Contractor shall provide and pay for temporary dumpster type trash containers outside the building for use by all Subcontractors, and shall have the containers replaced, hauled away, and the contents legally disposed of at sufficient intervals to maintain them at all times in sufficiently empty condition that they are ready to receive trash and debris.
- B. All construction dumpsters shall be located in the parking lot within the construction staging area and where permitted by the Owner.
- C. Each Contractor on the project shall be responsible for removing their own trash and debris from the building to the construction dumpster(s).
- D. Waste materials and rubbish, which might otherwise raise dust, shall be sprinkled during handling and loading to minimize this effect. Debris shall be carried out of the structure in containers or dropped in fully enclosed chutes and shall not be passed through, or thrown from, windows or other wall openings, and in no case shall the debris or trash be permitted to drop freely from the openings.
- E. The Work Areas shall be inspected daily and all debris, waste, rubbish, etc. shall be removed and placed in a dumpster.
- F. All waste materials and rubbish shall be disposed of legally, off the site.

2.17 TEMPORARY RODENT AND PEST CONTROL

- A. Rodent and Pest Control: Provide rodent control as necessary to prevent infestation of construction and storage areas. Employ methods and use materials, which will not adversely affect conditions at the site or on adjoining properties. Should rodenticides be considered necessary submit copies of proposed program to Owner and Architect. Use of rodenticide shall comply with manufacturer's published instructions and recommendations. Clearly indicate:
 - 1. Area or areas to be treated.
 - 2. Rodenticides to be used.
 - 3. Manufacturer's printed instructions.
 - 4. Pollution preventive measures to be employed.

2.18 WATCHMEN, FLAGMEN, AND POLICE DETAILS

A. The General Contractor shall provide the services of flagmen, traffic directors, and police details as necessary and as required by authorities having jurisdiction. Please refer to Section 01010 – Summary of Work for additional information regarding the police details and the appropriate pay rates.

2.19 PARKING

A. Parking will be permitted on site or as directed by the owner.

PART 3 - EXECUTION

3.1 OPERATION, TERMINATION AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition, until removal. Protect from damage. If damage occurs, repair immediately upon discovery. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour per day basis.
- C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended. Clean and renovate permanent facilities that have been used during construction period, including:
 - 1. Replace air filters and clean inside of ductwork and housings.
 - 2. Replace worn parts.
 - 3. Replace lamps.

END OF SECTION 015000

SECTION 016000 – PRODUCT REQUIREMENTS

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 specifies administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
- B. Reference Standards and Definitions: Refer to Section 014200 "References" for the applicability of industry standards to products specified.
- C. The Contractor's Construction Schedule and the Submittal Schedule are specified under Section 013300 "Submittals Procedures".
- D. Administration procedures for handling requests for substitutions made after award of the Contract are specified under Section 012500 "Substitution Procedures".

1.3 DEFINITIONS

- A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties", "systems", "structure", "finishes", "accessories", and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.
 - 1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material", "equipment", "system", and terms of similar intent.
 - a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature that is current as of the date of the Contract Documents.
 - 2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
 - 3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 SUBMITTALS

- A. Product List: Prepare a schedule in tabular form showing each product listed. Include the manufacturer's name and proprietary product names for each item listed.
 - 1. Coordinate product list with the Contractor's Construction Schedule and the Schedule of Submittals.
 - 2. Form: Prepare product list with information on each item tabulated under the following column headings:
 - a. Related Specification Section number.
 - b. Generic name used in Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Specific Product "Material Safety Data Sheet" reference.
 - 3. Submittal: Within twenty (20) days after date of commencement of the Work, submit four (4) copies of an initial product list. Provide a written explanation for omissions of data and for known variations from Contract requirements.
 - a. At the Contractor's option, the initial submittal may be limited to product selections and designations that must be established early in the Contract period.
 - 4. Architect's Action: The Architect will respond in writing to Contractor. No response constitutes no objection to listed manufacturers or products but does not constitute a waiver of the requirement that products comply with Contract Documents. The Architect's response will include the following:
 - a. A list of unacceptable product selections, containing a brief explanation of reasons for this action.

1.5 MATERIAL SAFETY DATA SHEETS MANUAL

- A. Within ten (10) days after submission of Product List Schedule and before materials may be delivered to jobsite, submit one (1) or more 8 ½ x 11 paper size three (3) ring binder with the Product List Schedule and Material Safety Data Sheet for each product. Using the Product List Schedule as table of contents arrange Materials Safety Data Sheets in table of contents order.
- B. Submit one (1) copy of materials Safety Data Sheet Manual to Clerk of the Works and Architect.
 - 1. Provide one (1) copy of Material Safety Data Sheets for insertion in Manual for products listed on additional Product List Schedules.
- C. This requirement is in addition to any obligation the Contractor has to maintain Material Safety Data Sheets at job site or elsewhere.

1.6 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
 - 1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.
- B. Compatibility of Options: When the Contractor is given the option of selecting between two (2) or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
 - 1. Schedule delivery to minimize long-term storage at the site.
 - 2. Coordinate delivery with installation time.
 - 3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 - 5. Store products at the site in a manner that will facilitate inspection.
 - 6. Store and maintain products within acceptable environmental ranges and conditions required by manufacturer's instructions.

1.8 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 MATERIALS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.
 - 1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
- B. Product Selection Procedures: Product Selection is governed by the Contract Documents and governing regulations; not by previous project experience. Procedures governing product selection include the following:
 - 1. Where products or manufacturers are specified by name, accompanied by the term "or equal" or "or approved equal", comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 - 2. Non-proprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, they do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 - 3. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
 - 4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated. General overall performance of a Product is implied where the product is specified for a specific application.
 - a. Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.
 - 5. Compliance with Standards, Codes, and Regulations: Where the Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
 - 6. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
 - a. Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for non-compliance with specified requirements.
 - 7. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures..." or a similar

phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selected.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
 - 1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 016000

SECTION 017400 - WARRANTIES AND BONDS

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 warranties required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's special warranty on workmanship and materials.
- B. General Closeout requirements and procedures are included in Section 017000 "Project Closeout".
 - 1. Specific requirements for warranties on products and installations specified to be warranted are included in the individual Sections of Divisions 2 through 16.
 - 2. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
- D. Separate Prime Contracts: Each prime contractor is responsible for warranties related to its own contract.

1.3 DEFINITIONS

- A. Standard Product Warranties are pre-printed written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation, as determined by the Architect.
- C. 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 the Contract Documents. The Contractor 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.
- D. 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.
 - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- E. The Owner reserves the right to refuse to accept the Work for the Project where a special warranty, certification or similar commitment on the Work or part of the Work is required, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTALS

- A. Submit written warranties to the Architect bound in the Project Closeout Manual as described in Section 017700 Closeout Procedures. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
 - 1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within ten (10) days of completion of that designated portion of the Work.
- B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties, submit a draft to the Architect, for approval prior to final execution.
- C. Prepare a written document utilizing the appropriate form, ready for execution by the Contractor, or by the Contractor and subcontractor, supplier, or manufacturer. Submit a draft to the Architect for approval prior to final execution.
 - 1. Refer to individual Sections of Divisions 2 through 16 for specific content requirements and particular requirements for submitting special warranties.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 WARRANTIES

- A. Schedule: Provide warranties on products and installations as specified in the appropriate Sections of the Specification.
 - 1. When products, equipment, or materials fail and/or continue to be a repetitive source of problems, with no satisfactory resolution (e.g. HVAC Equipment) during the warranty period, the Owner reserves the right to extend the period of time of the initial warranty period. If no satisfactory resolution can be reached during this resolution period, then the Owner reserves the right to demand for the full replacement of the particular item in question, including all associated work required to execute this replacement at no cost to the Owner.

END OF SECTION 017400

SECTION 017700 – CLOSEOUT PROCEDURES

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 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. Contractor's monetized punchlist.
 - 3. Project Record Document Submittal.
 - 4. Project Closeout Manual Submittal.
 - 5. Final cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request for which the architect shall review and/or approve.
 - 1. The contractor shall prepare and submit a monetized punchlist. No exceptions will be considered.
 - 2. In the Application for Payment that coincides with, or first allows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.
 - a. If 100 percent completion cannot be shown, the contractor shall provide his monetized punchlist including, but not limited to, the following:
 - 1) A list of incomplete items.
 - 2) The value of each incomplete item.
 - 3) A Reason each item is not complete.
 - 3. Advise the Owner of pending insurance changeover requirements.
 - 4. Submit application for reduction of retainage.
 - 5. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents, as further described below.
- 6. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
- 7. Submit record drawings, maintenance manuals, damage or settlement surveys, and similar final record information, as further described below.
- 8. Deliver tools, spare parts, extra stock, and similar items.
- 9. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
- 10. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
- 11. Complete final cleanup requirements, including touch-up painting.
- 12. Touch-up and otherwise repair and restore, marred, exposed finishes.
- B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
 - 1. The Architect will repeat inspection when requested and assured that the Work has been substantially completed.
 - 2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

- A. Preliminary procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
 - 1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted.
 - 2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
 - 3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.
 - 4. Submit consent to surety of final payment.
 - 5. Submit a final liquidated damages settlement statement.
 - 6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Re-inspection Procedure: The Architect will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has

been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.

- 1. Upon completion of re-inspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled, but are required for final acceptance.
- 2. If necessary, re-inspection will be repeated.

1.5 RECORD DOCUMENTS

- A. General: Maintain a complete set of Record Documents at the site. Do not use Record Documents for construction purposes. Provide access to Record Documents for Architect and Owner's reference. Generally, without limitation, Record Documents shall include the following:
 - 1. Record Drawings: Maintain a clean set of Mylars of Contract Drawings and shop drawings, updated weekly to show actual installation. Give particular attention to concealed items.
 - 2. Record Project Manual: Maintain a clean Project Manual, including Addenda, Change Orders, Architect Field Orders, and other modifications, updated weekly to show changes in actual work performed. Give particular attention to substitutions, selection of options, and similar information.
 - 3. Record Product Data: Maintain one copy of each approved Product Data submittal, updated weekly to show changes from products delivered, work performed, and from manufacturer's recommended installation instructions.
 - 4. Record Samples: Maintain one copy of each approved Sample submitted.
 - 5. Record Field Test Reports: Maintain one copy of each Field Test Report.
 - 6. Daily Progress Reports: Maintain one copy of each Daily Progress Report.
- B. Maintenance of Documents and Samples: Store documents and samples in Contractor's field office apart from documents used for construction. Provide files and racks for document storage. Provide locked cabinet or secure storage space for storage of samples. File documents and samples in accordance with CSI format. Maintain documents in clean, dry, legible condition and in good order. Do not use Record Documents for construction purposes. Make documents and samples available at all times for inspection by Architect.
- C. Recording: Label each document "PROJECT RECORD" in neat large printed letters. Record all information concurrently with the progress of construction. Do not conceal any work until required information is recorded.
- D. Drawings: Legibly update all Drawings to record actual construction, including the following:

- 1. Field changes of dimension and detail.
- 2. Changes made by Field Order or Change Order.
- 3. Details not in original Contract Documents.
- E. Specifications and Addenda: Legibly mark each Section to record:
 - 1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 - 2. Changes made by Field Order or by Change Order.
- F. Submittal: At Contract Closeout, deliver Record Documents to Architect. Accompany submittal with transmittal letter in duplicate, indicating the date, Project title and number, Contractor's name and address, title and number of Record Document, and signature of Contractor or his authorized representative.

1.6 PROJECT CLOSEOUT MANUAL

- A. General: Prepare and submit Project Closeout Manual as specified in this Section and as approved by the Architect for format. Organize data into suitable sets, bound and indexed using the specification's Table of Contents as a guide. Mark appropriate identification on front and spine of each binder. Include the following types of information:
 - 1. Contact Persons' Names
 - 2. Telephone Numbers
 - 3. Pager or Beeper Numbers
 - 4. Cellular Phone Numbers
 - 5. Description of each warranty items covered.
 - 6. Instructions Describing Protocol for Requesting Warranty Service.
 - 7. Emergency Numbers 911, Fire, Rescue, Police.
 - 8. Utility Company Contacts.
- B. Instruct Owner's personnel in use and layout of manual.
- C. Format of Data: Prepare data in form of user's guide-type manual for use by Owner's personnel. Format shall be 8-1/2 in. x 11 in., 20-pound minimum, white, typed pages. Text shall be printed or neatly typewritten. Drawings shall be bound with text, with reinforced punched binder tabs. Fold larger drawings to size of text pages. Provide flyleaf for each separate section. Provide typed descriptions of each product and piece of major equipment. Provide indexed tabs to divide sections. Provide reference in each section to other binders for actual Operating and Maintenance Data. Coordinate Project Closeout Manual with Operating and Maintenance Data.
 - 1. Binders: Provide commercial quality three-ring binders with durable and cleanable plastic covers, with maximum ring size of three (3) inches. Only use one (1) binder for this manual.
 - 2. Binder Cover: Identify each volume with typed or printed title "PROJECT CLOSEOUT MANUAL". List title of Project, identity of

separate structure as applicable, and identity of general subject matter covered in the manual.

- D. Submittal of Project Closeout Manual: Submit two copies of preliminary draft of proposed formats and outlines of contents prior to start of Work.
 - 1. Architect will review draft and return one copy with comments.
 - 2. Submit one copy of complete data in final form 15 days prior to final inspection or acceptance. Copy will be returned after final inspection or acceptance, with comments.
 - 3. Submit three copies of approved data in final form ten days after final inspection or acceptance.

1.7 OPERATING AND MAINTENANCE DATA

- General: Prepare and submit Operating and Maintenance Data as specified in this Section and referenced in other pertinent Sections of Specifications. Organize Operating and Maintenance Data into suitable sets, bound and indexed. Mark appropriate identification on front and spine of each binder. Include the following types of information:
 - 1. Emergency instructions.
 - 2. Spare parts list.
 - 3. Copies of warranties.
 - 4. Wiring diagrams.
 - 5. Inspection procedures.
- B. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.
- C. Preparation of data shall be done by personnel trained and experienced in maintenance and operation of described products.
- D. Format of Data: Prepare data in form of instructional manual for use by Owner's personnel. Format shall be 8-1/2 in. x 11 in., 20-pound minimum, white, typed pages. Text shall be manufacturer's printed data, or neatly typewritten. Drawings shall be bound with text, with reinforced punched binder tabs. Fold larger drawings to size of text pages. Provide flyleaf for each separate product or each piece of operating equipment. Provide typed description of product and major component parts of equipment. Provide indexed tabs.
 - 1. Binders: Provide commercial quality three-ring binders with durable and cleanable plastic covers, with maximum ring size of two (2) inches. When multiple binders are used, correlate the data into related consistent groupings.
 - 2. Binder Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List title of Project, identity of separate structure as applicable, and identity of general subject matter covered in the manual.

- E. Content of Manual: Neatly typewritten table of contents for each volume, arranged in systematic order, indicating Contractor name and address, and a list of each product, indexed to content of the volume. Provide a separate list with each product, name, address, and telephone number of subcontractor or installer, and local source of supply for parts and replacement.
 - 1. Provide in each volume a copy of each warranty, bond, and service contract issued.
- F. Submittal of Maintenance and Operating Manual: Submit two copies of preliminary draft of proposed formats and outlines of contents prior to start of Work.
 - 1. Architect will review draft and return one copy with comments.
 - 2. Submit one copy of complete data in final form 15 days prior to final inspection or acceptance. Copy will be returned after final inspection or acceptance, with comments.
 - 3. Submit three copies of approved data in final form ten days after final inspection or acceptance.

1.8 INSTRUCTION OF OWNER'S PERSONNEL

- A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of products, equipment and systems.
- B. Operating and maintenance manual shall constitute the basis of instruction.
 - 1. Review contents of manual with personnel in full detail to explain all aspects of operation and maintenance.

1.9 WARRANTIES AND BONDS

- A. General: Assemble warranties, bonds, and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors into the Project Closeout Manual.
- B. Refer to Section 017400 Warranties and Bonds for additional requirements.

1.10 FINAL CLEANING

- A. General: General cleaning during construction operations is specified as Work of Section 015000 Temporary Facilities & Controls.
- B. Employ experienced workers or professional cleaners for Final Cleaning. Clean each surface to the condition expected in a normal building cleaning and maintenance program. Comply with manufacturer's instructions and recommendations.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

- A. General: Provide cleaning materials that will not create hazards to health nor property, and will not damage surfaces or finishes.
- B. Use cleaning materials and methods recommended by manufacturer of surface to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. Employ skilled workers for final cleaning.
- B. Clean and restore general work areas and adjoining surfaces and other work soiled or damaged during installation; replace work damaged beyond successful restoration. Where performance of subsequent work could result in damage to complete unit or element, provide protective covering and other provisions to minimize potential for damage.
- C. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.
- D. Special Cleaning for Windows: New glass installed as part of this project shall be thoroughly cleaned inside and out by professional window cleaners at the conclusion of all other work and prior substantial completion. All damaged, broken, or scratched items shall be replaced without costs to Owner, as described under the appropriate Trade Section(s).
- E. Complete the following cleaning operations prior to requesting inspection for Certification of Substantial Completion:
 - 1. Concrete and masonry shall be cleaned free of all foreign matter. If, in opinion of the Architect, further cleaning of specific areas is required they shall be scrubbed with water or other cleaning agents. Acid cleaners shall not be used, except as may otherwise specifically be permitted in the trade sections.
 - 2. Metal surfaces, hardware, fixtures, appliances, equipment, and similar items shall be cleaned free of all foreign matter and, if necessary, shall be lightly scrubbed at specific stains with clean water, mild soap, and soft rags, thoroughly rinsed and wiped with clean, soft white rags. Abrasive cleaners shall not be used.
 - 3. Architectural woodwork shall be thoroughly dusted and cleaned of all stains, spots, etc., using methods and cleaning agents, which will not damage the various finishes.

- 4. Ceramic tile, porcelain, and other surfaces with integral finishes, shall be washed with clean water, mild soap and soft rags, thoroughly rinsed, and then wiped with clean, soft white rags. Abrasive cleaners shall not be used.
- 5. Resilient flooring shall be given final cleaning and buffing.
- 6. Carpeting shall be vacuum cleaned and shall have all spots and stains removed.
- 7. Painted surfaces shall be cleaned free of all foreign matter, and if necessary, shall be lightly scrubbed at specific stains with clean water, mild soap, and soft rags, thoroughly rinsed, and wiped with clean, soft white rags.
- 8. All advertising matter and temporary instructional material shall be removed from exposed surfaces throughout.
- 9. Remove labels that are not permanent.
- 10. Clean interior and exterior finishes to a clean, dust-free condition. Remove stains, films, and similar foreign substances.
- 11. Vacuum and mop hard floor surfaces.
- 12. Clean plumbing fixtures to a sanitary condition.
- 13. Clean site areas of rubbish, litter, and other foreign substances.
- 14. Sweep paved areas broom clean; rake ground surfaces clean.
- F. Before final completion and Owner-occupancy, inspect sight-exposed interior and exterior surfaces and work areas to verify that Work is clean.

END OF SECTION 017700

SECTION 071416 - COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:

A. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors". The following shall appear on the upper left hand of the envelope:

Name of Sub-Bidder:Print Name of Sub-bidderProject:REGIONAL EMERGENCY COMMUNICATIONS CENTERSub-Bid for Section:071416 - COLD FLUID-APPLIED WATERPROOFING

- B. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 in person, or by written request.
- C. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.
- D. Additional Requirements:
 - 1. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:
 - 2. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is

qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

| Class of Work | Reference Specification | Paragraphs |
|---------------|-------------------------|------------|
| | | |
| | | |
| | | |

E. The work done by this sub-bidder is shown on the following drawings:

| T1.0 | TITLE SHEET | |
|-----------------|--|--|
| | | |
| CIVIL | | |
| C1 | EXISTING CONDITIONS | |
| C2 | DEMOLITION PLAN | |
| C3 | EROSION AND SEDIMENT CONTROL | |
| C4.1 | SITE PLAN – BASE BID | |
| C4.2 | SITE PLAN – ALTERNATES | |
| C5 | DRAINAGE AND UTILITIES | |
| C6 | DETAILS | |
| | | |
| ARCHITECTURAL | | |
| D1.0 | DEMOLITION PLAN-EXISTING PLAN & ELEVATIONS | |
| A1.0 | EXISTING FOUNDATION WORK PLAN & DETAILS | |
| A1.1 | FLOOR PLAN & DETAILS | |
| A1.2 | FIRST FLOOR PLAN - ENLARGED | |
| A1.3 | ROOF PLAN & DETAILS | |
| A1.4 | COVERED TRAILER STORAGE | |
| A2.1 | ELEVATIONS | |
| A3.1 | BUILDING SECTIONS | |
| A4.1 | WALL SECTIONS | |
| A4.2 | WALL SECTIONS | |
| A5.1 | SECTION DETAILS | |
| A6.1 | INTERIOR ELEVATIONS | |
| A6.2 | INTERIOR ELEVATIONS | |
| A6.3 | INTERIOR ELEVATIONS | |
| A7.1 | REFLECTED CEILING PLANS | |
| A8.1 | SCHEDULES & DETAILS | |
| | | |
| FIRE PROTECTION | I | |
| FP0.1 | FIRE PROTECTION LEGEND, NOTES & DETAILS | |
| FP0.2 | FIRE PROTECTION DETAILS | |
| FP2.0 | FIRE PROTECTION DEMOLITION PLAN | |
| FP3.1 | FIRE PROTECTION FLOOR PLANS | |
| | | |

| PLUMBING | | |
|------------|---|--|
| P0.1 | PLUMBING LEGEND, NOTES & SCHEDULES | |
| P0.2 | PLUMBING DETAILS | |
| P2.0 | PLUMBING DEMOLITION PLAN | |
| P3.1 | PLUMBING FLOOR PLANS | |
| P3.2 | PLUMBING FLOOR PLANS | |
| | | |
| HVAC | | |
| H0.1 | HVAC LEGEND & GENERAL NOTES | |
| H0.2 | HVAC LEGEND & GENERAL NOTES | |
| H0.3 | HVAC SCHEDULES | |
| H0.4 | HVAC DETAILS | |
| H0.5 | HVAC DETAILS | |
| H0.6 | HVAC CONTROLS | |
| H1.1 | HVAC DEMOLITION PLAN | |
| H2.1 | HVAC LEVEL 1 FLOOR PLAN | |
| H2.2 | HVAC ROOF PLAN | |
| | | |
| ELECTRICAL | | |
| E0.1 | ELECTRICAL LEGEND AND NOTES | |
| E0.2 | ELECTRICAL SYSTEMS RISER DIAGRAMS | |
| E0.3 | ELECTRICAL SYSTEMS RISER DIAGRAMS | |
| E0.4 | ELECTRICAL SCHEDULES | |
| E0.5 | ELECTRICAL DETAILS | |
| E0.6 | ELECTRICAL DETAILS | |
| E1.0 | ELECTRICAL SITE PLAN | |
| E2.0 | FIRST FLOOR PLAN ELECTRICAL DEMOLITION | |
| E3.0 | FIRST FLOOR PLAN LIGHTING PLAN | |
| E3.1 | FIRST FLOOR PLAN ELECTRICAL POWER PLAN | |
| E3.2 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART | |
| | PLAN | |
| E3.3 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART | |
| | PLAN | |
| E3.4 | FIRST FLOOR PLAN ELECTRICAL FIRE ALARM PLAN | |
| E3.5 | FIRST FLOOR PLAN ELECTRICAL SECURITY PLAN | |
| E3.6 | ROOF ELECTRICAL PLAN | |
| E3.7 | ROOF ELECTRICAL LIGHTING PROTECTION PLAN | |

1.3 SUMMARY

- A. Section Includes:
 - 1. Polyurethane waterproofing.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

- 1. Review waterproofing requirements including, but not limited to, the following:
 - a. Surface preparation specified in other Sections.
 - b. Minimum curing period.
 - c. Forecasted weather conditions.
 - d. Special details and sheet flashings.
 - e. Repairs.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
 - 2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.
- B. Shop Drawings:
 - 1. Show locations and extent of waterproofing.
 - 2. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
- C. Samples: For each exposed product and for each color and texture specified, including the following products:
 - 1. Flashing sheet, 8 by 8 inches.
 - 2. Membrane-reinforcing fabric, 8 by 8 inches.
 - 3. Insulation Drainage Panel, 8 by 8 inches.
 - 4. Drainage panel, 4 by 4 inches.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.

- 1. Build mockup for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, and protection.
 - a. Size: 100 sq. ft. in area.
 - b. Description: Each type of wall installation.
- 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer.
 - 1. Do not apply waterproofing to a damp or wet substrate, unless designed for such application, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.
 - 2. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.
- B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.9 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace waterproofing that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- B. Installer's Special Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of two years.
 - 1. Warranty includes excavation, removing and reinstalling protection board, drainage panels, insulation, restoration of drainage, grading and pavements.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, and molded-sheet drainage panels from single source from single manufacturer.

2.2 SINGLE-COMPONENT POLYURETHANE WATERPROOFING

- A. Single-Component, Modified Polyurethane Waterproofing: ASTM C 836/C 836M and coal-tar free.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Tremco Inc. TREMproof 201/60 or TREMproof 250 GC (for green or damp concrete) or comparable product by one of the following:
 - a. Anti-Hydro International, Inc.
 - b. BASF Corporation-Construction Systems.
 - c. CETCO, a Minerals Technologies company.
 - d. ITW Polymers Sealants North America (formerly Pacific Polymers, Inc.).
 - e. Neogard; a division of Jones-Blair, Inc.
 - f. Polyguard Products, Inc.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials recommended in writing by waterproofing manufacturer for intended use and compatible with one another and with waterproofing.
 - 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Manufacturer's standard primer, sealer, or surface conditioner; factory-formulated acrylic latex, polyurethane, or epoxy.
- C. Sheet Flashing: 50-mil-minimum, nonstaining, uncured sheet neoprene.
 - 1. Adhesive: Manufacturer's recommended contact adhesive.
- D. Membrane-Reinforcing Fabric: Manufacturer's recommended woven fiberglass scrim fabric, manufacturer's standard weight.
- E. Joint Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric.
- F. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing; ASTM C 920, Type M, Class 25 or greater; Grade NS for sloping and vertical applications and Grade P for deck applications; Use NT exposure; and as recommended by manufacturer for substrate and joint conditions.
 - 1. Backer Rod: Closed-cell polyethylene foam.

2.4 PROTECTION COURSE

- A. Protection course: As recommended by waterproofing membrane manufacturer.
 - 1. Basis-of-Design Product: Protection Mat; Tremco Inc.

a. Polyester fabric: 100 mils thick, 14 oz. per sq. yd.

2.5 INSULATION DRAINAGE PANELS

- A. Unfaced, Wall-Insulation Drainage Panels: Extruded-polystyrene board insulation according to ASTM C 578, Type IV; unfaced; fabricated with shiplap or channel edges and with one side having grooved drainage channels.
 - 1. Thickness: 2.125 inches.
 - 2. Compressive Strength: 30 psi (ASTM D 1621-94).
 - 3. R-Value as per ASTM C 518-91: 10.0 (ASTM C 518-91).
 - 4. Water Absorption: Max. 0.3% by volume, ASTM C 272.
 - 5. Surface Burning Characteristics: Flame Spread: 5; Smoke Developed: 165.
 - 6. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. The Dow Chemical Company, STYROFOAM Brand PERIMATE Extruded Polystyrene Foam Insulation.
- B. Adhesive: Mastic type recommended by insulating drainage panel manufacturer as compatible with drainage panel and the waterproofing.
 - 1. Acceptable products:
 - a. ChemRex, Inc. "Contech Brand PL300 Foam Board Adhesive".
 - b. ChemRex, Inc. "Contech Brand Premium Foam Board Adhesive".
 - c. Dacar Products, Inc. "Foamgrab PS".
- C. Above-Grade Protective Finish: Provide finish system recommended by insulating drainage panel manufacturer to protect insulation exposed above grade from physical damage and ultraviolet exposure.
 - 1. Basis-of-Design Product: Tremco "Horizon Coat"; elastomeric, emulsion based.
 - a. Color and Texture: Gray, matte finish.
 - b. Application Method: Airless spray or brush.
 - c. Application Temperature: 32 deg F to 100 deg F.
 - d. Cure Time: 24 hours.
 - e. Film Thickness: 40 mils dry at 20 sf/gal.
 - f. Elongation: 150 percent (ASTM D2370).
 - g. Mandrel Bend: $\frac{1}{2}$ inch at minus15 deg F (ASTM C711).
 - h. Shore "A" Hardness: 70 (ASTM D2270).
 - i. Water Vapor Permeance: 6 perms (ASTM E96).
 - j. Solids: 63 percent +/- 2 percent by weight.
 - k. Density: 11 lbs/gal.
 - 2. Contractor's Option: Fiberglass-scrim-reinforced acrylic finish system, Styro Industries, Inc., Tuff-II.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
 - 2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, acid residues, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, holes, and other voids.

3.3 PREPARATION AT TERMINATIONS, PENETRATIONS, AND CORNERS

- A. Prepare surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, sleeves, and corners according to waterproofing manufacturer's written instructions and to recommendations in ASTM C 1471.
- B. Apply waterproofing in two separate applications, and embed a joint reinforcing strip in the first preparation coat when recommended by waterproofing manufacturer.

3.4 JOINT AND CRACK TREATMENT

- A. Prepare, treat, rout, and fill joints and cracks in substrate according to waterproofing manufacturer's written instructions and to recommendations in ASTM C 1471. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.
 - 1. Comply with ASTM C 1193 for joint-sealant installation.
 - 2. Apply bond breaker on sealant surface, beneath preparation strip.

- 3. Prime substrate along each side of joint and apply a single thickness of preparation strip at least 6 inches wide along each side of joint. Apply waterproofing in two separate applications and embed a joint reinforcing strip in the first preparation coat.
- B. Install neoprene sheet flashing and bond to wall substrates where required according to waterproofing manufacturer's written instructions.
 - 1. Extend sheet flashings for 4 inches onto perpendicular surfaces and items penetrating substrate.

3.5 WATERPROOFING APPLICATION

- A. Apply waterproofing according to manufacturer's written instructions and to recommendations in ASTM C 1471.
- B. Start installing waterproofing in presence of manufacturer's technical representative.
- C. Apply primer over prepared substrate unless otherwise instructed in writing by waterproofing manufacturer.
- D. Unreinforced Waterproofing Applications: Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.
 - 1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases and pinholes, with a dry film thickness recommended by manufacturer.
 - 2. Apply waterproofing to prepared wall terminations and vertical surfaces.
 - 3. Verify manufacturer's recommended wet film thickness of waterproofing every 100 sq. ft.
- E. Cure waterproofing, taking care to prevent contamination and damage during application and curing.
- F. Install protection course over waterproofing before starting subsequent construction operations.
 - 1. For vertical applications, set protection course in nominally cured membrane, which will act as an adhesive. If membrane cures before application of protection course, use adhesive.
 - 2. Insulation drainage panels may be used in place of a separate protection course for vertical applications when approved in writing by waterproofing manufacturer.

3.6 INSULATION DRAINAGE PANEL INSTALLATION

- A. Install drainage panels over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.
- B. Ensure that drainage channels are aligned and free of obstructions.

- C. On vertical surfaces, set insulation drainage panels in adhesive or tape applied according to manufacturer's written instructions.
 - 1. Apply mastic adhesive in six 2-inch diameter equally-spaced daubs on the smooth side of panels to adhere them to the cured waterproofing temporarily until backfill is in place.
- D. Install first panel vertically, with long edge flush with a corner.
 - 1. Shiplap on long edge of panel shall overlap previous panel. Continue until a comer is reached.
 - 2. Cut and install corner panels, cutting off shiplap at corner.
- E. When additional tiers are required, shiplap edges at both horizontal and vertical joints.
- F. Extend top edge of panels to metal wall panel base flashing.
- G. Protect exposed panels above grade from physical damage and ultraviolet exposure with metal or elastomeric flashing, or above-grade protective finish suitable for ground contact.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections:
 - 1. Testing agency shall verify thickness of waterproofing during application for each 600 sq. ft. of installed waterproofing or part thereof.
- B. Manufacturer's Field Service: Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components and to furnish daily reports to Architect.
- C. If test results or inspections show waterproofing does not comply with requirements, remove and replace or repair the waterproofing as recommended in writing by manufacturer, and make further repairs after retesting and inspecting until waterproofing installation passes.
- D. Prepare test and inspection reports.

3.8 **PROTECTION**

- A. Protect waterproofing from damage and wear during remainder of construction period.
- B. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

- C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 071416

SECTION 081213 – HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Steel door frames.
 - 2. Glazing in hollow metal frames.
- B. Related Sections include the following:
 - 1. Division 8 Section "Door Hardware" for door hardware.
 - 2. Division 9 Section "Gypsum Board Assemblies" for installing frames in drywall construction
 - 3. Division 9 Section "Painting" for field painting factory-primed doors and frames.
 - 4. Division 13 Section "Metal Building Systems" for steel doors and frames installed in metal building walls.

1.3 DEFINITIONS

A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

1.4 SUBMITTALS

- A. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, typical construction details, label compliance, sound and fire-resistance ratings, and finishes.
- B. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.
 - 1. Indicate head and jamb conditions coordinated with typical construction details shown in product data.

1.5 QUALITY ASSURANCE

- A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.
- B. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factoryfinished doors and frames.
- B. Inspect doors and frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4-inch-high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Steel Doors and Frames:
 - a. Ceco Door Products; a United Dominion Company.
 - b. Republic, a division of Windsor Republic Doors.
 - c. Steelcraft; a division of Ingersoll-Rand.

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M, Commercial Steel (CS), or ASTM A 620/A 620M, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.

- C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.
- D. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear), Condition A (uncoated), Kind FT (fully-tempered).

2.3 FRAMES

- A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.
- B. Frames of 0.053-inch- thick steel sheet for:
 - 1. Level 2 steel doors.
- C. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.
- D. Plaster Guards: Provide 0.016-inch- thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.
- E. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.
 - 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
- F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

2.4 FABRICATION

- A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
- B. Interior Door Faces: Fabricate exposed faces of doors from the following material:
 - 1. Cold-rolled steel sheet.
- C. Core Construction: Manufacturer's standard core construction that produces a door complying with SDI standards.

- D. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between pairs of doors. Not more than 3/4 inch at bottom.
- E. Single-Acting, Door-Edge Profile: Beveled edge.
- F. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- G. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
- H. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
- I. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
- J. Frame Construction: Fabricate frames as follows:
 - 1. Double rabbeted.
 - 2. 2-inch wide jambs.
 - 3. 2-inch wide heads.
 - 4. Provide welded frames with temporary spreader bars.
 - 5. Dimple frame for countersunk flat head anchoring screws at concrete jambs.
- K. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
- L. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

2.5 FINISHES

A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Prior to wall construction, set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Install frames with removable glazing stops located on secure side of opening.
 - c. Install door silencers in frames before grouting.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - f. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

- 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Anchors in concrete floors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - b. Anchor frames at access flooring as recommended by floor system manufacturer.
- 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
- 4. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
- 5. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Glazing: Comply with hollow metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081213

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Factory finishing flush wood doors.
 - 3. Glazing in flush wood doors.
 - 4. Factory fitting flush wood doors to frames and factory machining for hardware.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
 - 2. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
- C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
 - 1. Dimensions and locations of blocking.
 - 2. Dimensions and locations of mortises and holes for hardware.
 - 3. Dimensions and locations of cutouts.
 - 4. Undercuts.
 - 5. Doors to be factory finished and finish requirements.
- D. Samples for Initial Selection: For factory-finished doors.
- E. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.

2. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.
- B. Quality Standard Compliance Certificates: AWI Quality Certification or WI Certified Compliance Program certificates, as applicable.

1.5 QUALITY ASSURANCE

A. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.8 WARRANTY

- A. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3inch span.
 - 2. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Algoma Hardwoods, Inc.
 - 2. Eggers Industries.
 - 3. Mohawk Flush Doors, Inc.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."
 - 1. Provide WI Certified Compliance Labels indicating that doors comply with requirements of grades specified.
- B. Adhesives: Do not use adhesives that contain urea formaldehyde.
- C. Composite Wood Products: Products shall be made without urea formaldehyde.
- D. WDMA I.S.1-A Performance Grade: Heavy Duty.
- E. Structural-Composite-Lumber-Core Doors:
 - 1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf.
 - b. Screw Withdrawal, Edge: 400 lbf.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
 - 1. Grade: Premium, with Grade A faces.
 - 2. Species: Select white ash.
 - 3. Cut: Plain sliced (flat sliced) or quarter sliced.
 - 4. Match between Veneer Leaves: Slip match.
 - 5. Assembly of Veneer Leaves on Door Faces: Running match.
 - 6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 - 7. Exposed Vertical Edges: Same species as faces edge Type A.
 - 8. Core: Structural composite lumber.

9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.

2.4 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
 - 1. Wood Species: Same species as door faces.
 - 2. Profile: Flush rectangular beads preferred. Manufacturer's standard shape acceptable.

2.5 GLAZING

A. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear), Condition A (uncoated), Kind FT (fully-tempered).

2.6 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 1. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Openings: Factory cut and trim openings through doors.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished.

2.7 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors that are indicated to receive transparent finish.
- C. Transparent Finish:

- 1. Grade: Premium.
- 2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 10, UV curable, water based.
 - a. Gardall System by Eggers Industries, or equal non-VOC system.
- 3. Staining: Water-based, as selected by Architect from manufacturer's full range.
- 4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware." or Section 087111 "Door Hardware (Descriptive Specification)."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 084413 – GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

- 1. Glazed aluminum curtain walls.
- 2. Exterior manual-swing entrance doors and door-frame units.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - 2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
 - a. Joinery, including concealed welds.
 - b. Anchorage.
 - c. Expansion provisions.
 - d. Glazing.

- e. Flashing and drainage.
- 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- F. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
 - 1. Joinery, including concealed welds.
 - 2. Anchorage.
 - 3. Expansion provisions.
 - 4. Glazing.
 - 5. Flashing and drainage.
- G. Delegated-Design Submittal: For glazed aluminum curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.
- C. Product Test Reports: For glazed aluminum curtain walls, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Source quality-control reports.
- E. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

- B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 WARRANTY

- A. Special Assembly Warranty: Installer agrees to repair or replace components of glazed aluminum curtain wall including aluminum entrance that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Three (3) years from date of Substantial Completion.
- B. Glass: Provide written warranty for insulated glass units that they will be free from obstruction of vision as a result of dust or film formation on the internal glass surfaces caused by failure of the hermetic seal due to defects in material and workmanship.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.
- C. Finish: Provide written warranty for high-performance organic finish based on AAMA standard 2605.
 - 1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazed aluminum curtain walls.
 - 1. Engineer shall confirm the design requirements of the building code and referenced standards cited here but shall not lessen minimum quantities or raise maximum quantities indicated herein without approval by the Architect.

- B. Occupancy Category: This building is assigned to Occupancy Category IV as defined in ASCE 7, Table 1.1 and Massachusetts State Building Code 8th Edition, Table 1604.5 as an essential facility "for designated emergency preparedness, communications and operations centers and other facilities required for emergency response."
- C. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- D. Structural Loads:
 - 1. Wind Loads: As required by the Massachusetts Building Code Eight Edition.
 - 2. Other Design Loads: As determined by the delegated design engineer.
- E. Deflection of Framing Members: At design wind pressure, as follows:
 - 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller, and, amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
- F. Structural: Test according to ASTM E 330 as follows:
 - 1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
 - 2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
 - 3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- G. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
 - 1. Fixed Framing and Glass Area:

- a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
- H. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
 - 1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- I. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the Massachusetts Building Code 8th Edition.
- J. Energy Performance: Certify and label energy performance according to NFRC as follows:
 - 1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.37 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
 - 2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
 - 3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRCcertified condensation resistance rating of no less than 62 as determined according to NFRC 500.
- K. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone 2.
 - 1. Large-Missile Test: For glazed openings located within 30 feet of grade.
 - 2. Small-Missile Test: For glazed openings located more than 30 feet above grade.
- L. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide EFCO Corporation Series 5600 Outside Glazed Curtain Wall System with Duracast Fiberglass Pressure Plate or comparable product by one of the following:
 - 1. Kawneer North America.
 - 2. Tubelite Inc.
- B. Source Limitations: Obtain all components of curtain wall system, including framing, spandrel panels, venting windows, entrances, sun control and accessories, from single manufacturer.

2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Vertical and horizontal extrusions shall have a minimum wall thickness of 0.093 inches.
 - 2. Construction: Thermally broken.
 - 3. Glazing System: Retained mechanically with gaskets on four sides.
 - 4. Glazing Plane: Front.
 - 5. Finish: High-performance organic finish.
 - 6. Fabrication Method: Either factory- or field-fabricated system.
- B. Pressure Caps: Manufacturer's standard non-thermally conductive components that mechanically retain glazing.
 - 1. Provide Efco Duracast[®] Pressure Plate.
 - 2. Material shall be a fiberglass composite with a Flexural strength of no less than 82 ksi along the lineal's major axis.
 - 3. Material thermal conductivity shall be no more than 2 BTU·in/hr·ft²· $^{\circ}$ F.
 - 4. Include snap-on aluminum trim that conceals fasteners.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Materials:
 - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
 - 2. Steel Reinforcement: Manufacturer's standard internal steel reinforcement of aluminum framing.
 - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCES

- A. Provide handicapped accessible aluminum entrance for installation in the curtain wall system, including frame, door, glazing, hardware, and related components as shown on the drawings and specified in this section.
- B. Provide EFCO Series D518 DuraStile Wide Stile Entrance Door and Frame with 10-inch high bottom rail, fabricated for installation in the curtain wall system.

- C. Glass and Glazing: All units shall be factory glazed. Glass and insulating glass units shall match the glazing of the curtain wall system.
- D. Hardware: Provide BHMA Grade 1 hardware as follows:
 - 1. Butt hinges, continuous geared hinges, or pivots.
 - 2. Rim lock exit device and electric strike for wiring to building security system. Provide tubular exterior trimProvide temporary cylinder and two keys.
 - 3. Overhead closer with hold-open feature.
 - 4. Threshold coordinated with entrance mat frame.
 - 5. Weather stripping.

2.5 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.
 - 1. Sealant shall have a VOC content of 250 g/L or less.

2.6 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
 - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials, or, dead-soft, 0.018-inch-thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.
2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Physical and thermal isolation of glazing from framing members.
 - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 5. Provisions for field replacement of glazing from exterior.
 - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Fabricate components to resist water penetration as follows:
 - 1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
 - 2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
- E. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard assembly method.
 - 1. Frame components shall be mechanically fastened by means of extruded aluminum shear blocks attached to vertical mullions
- F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 6. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
 - 7. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum is in contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install glazing as specified in Section 088000 "Glazing" in accordance with approved submittals.

3.3 ERECTION TOLERANCES

- A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:
 - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
 - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
 - 3. Alignment:

- a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
- b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
- c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
- 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Test Area: Perform tests on representative areas of glazed aluminum curtain walls.
- C. Field Quality-Control Testing: Perform the following test on representative areas of glazed aluminum curtain walls.
 - 1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
 - a. Perform a minimum of two tests in areas as directed by Architect.
 - 2. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
 - a. Perform a minimum of two tests in areas as directed by Architect.
 - 3. Water Penetration: ASTM E 1105 at a minimum uniform and cyclic static-airpressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.
- D. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 084413

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:

A. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors". The following shall appear on the upper left hand of the envelope:

Name of Sub-Bidder:Print Name of Sub-bidderProject:REGIONAL EMERGENCY COMMUNICATIONS CENTERSub-Bid for Section:088000 - GLAZING

- B. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 in person, or by written request.
- C. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.
- D. Additional Requirements:
 - 1. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:
 - 2. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is

qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

| Class of Work | Reference Specification | Paragraphs |
|---------------|-------------------------|------------|
| | | |
| | | |
| | | |

E. The work done by this sub-bidder is shown on the following drawings:

| T1.0 | TITLE SHEET | | |
|-----------------|--|--|--|
| | | | |
| CIVIL | CIVIL | | |
| C1 | EXISTING CONDITIONS | | |
| C2 | DEMOLITION PLAN | | |
| C3 | EROSION AND SEDIMENT CONTROL | | |
| C4.1 | SITE PLAN – BASE BID | | |
| C4.2 | SITE PLAN – ALTERNATES | | |
| C5 | DRAINAGE AND UTILITIES | | |
| C6 | DETAILS | | |
| | | | |
| ARCHITECTURAL | | | |
| D1.0 | DEMOLITION PLAN-EXISTING PLAN & ELEVATIONS | | |
| A1.0 | EXISTING FOUNDATION WORK PLAN & DETAILS | | |
| A1.1 | FLOOR PLAN & DETAILS | | |
| A1.2 | FIRST FLOOR PLAN - ENLARGED | | |
| A1.3 | ROOF PLAN & DETAILS | | |
| A1.4 | COVERED TRAILER STORAGE | | |
| A2.1 | ELEVATIONS | | |
| A3.1 | BUILDING SECTIONS | | |
| A4.1 | WALL SECTIONS | | |
| A4.2 | WALL SECTIONS | | |
| A5.1 | SECTION DETAILS | | |
| A6.1 | INTERIOR ELEVATIONS | | |
| A6.2 | INTERIOR ELEVATIONS | | |
| A6.3 | INTERIOR ELEVATIONS | | |
| A7.1 | REFLECTED CEILING PLANS | | |
| A8.1 | SCHEDULES & DETAILS | | |
| | | | |
| FIRE PROTECTION | I | | |
| FP0.1 | FIRE PROTECTION LEGEND, NOTES & DETAILS | | |
| FP0.2 | FIRE PROTECTION DETAILS | | |
| FP2.0 | FIRE PROTECTION DEMOLITION PLAN | | |
| FP3.1 | FIRE PROTECTION FLOOR PLANS | | |
| | | | |

| PLUMBING | | |
|------------|---|--|
| P0.1 | PLUMBING LEGEND, NOTES & SCHEDULES | |
| P0.2 | PLUMBING DETAILS | |
| P2.0 | PLUMBING DEMOLITION PLAN | |
| P3.1 | PLUMBING FLOOR PLANS | |
| P3.2 | PLUMBING FLOOR PLANS | |
| | | |
| HVAC | | |
| H0.1 | HVAC LEGEND & GENERAL NOTES | |
| H0.2 | HVAC LEGEND & GENERAL NOTES | |
| H0.3 | HVAC SCHEDULES | |
| H0.4 | HVAC DETAILS | |
| H0.5 | HVAC DETAILS | |
| H0.6 | HVAC CONTROLS | |
| H1.1 | HVAC DEMOLITION PLAN | |
| H2.1 | HVAC LEVEL 1 FLOOR PLAN | |
| H2.2 | HVAC ROOF PLAN | |
| | | |
| ELECTRICAL | | |
| E0.1 | ELECTRICAL LEGEND AND NOTES | |
| E0.2 | ELECTRICAL SYSTEMS RISER DIAGRAMS | |
| E0.3 | ELECTRICAL SYSTEMS RISER DIAGRAMS | |
| E0.4 | ELECTRICAL SCHEDULES | |
| E0.5 | ELECTRICAL DETAILS | |
| E0.6 | ELECTRICAL DETAILS | |
| E1.0 | ELECTRICAL SITE PLAN | |
| E2.0 | FIRST FLOOR PLAN ELECTRICAL DEMOLITION | |
| E3.0 | FIRST FLOOR PLAN LIGHTING PLAN | |
| E3.1 | FIRST FLOOR PLAN ELECTRICAL POWER PLAN | |
| E3.2 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART | |
| | PLAN | |
| E3.3 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART | |
| | PLAN | |
| E3.4 | FIRST FLOOR PLAN ELECTRICAL FIRE ALARM PLAN | |
| E3.5 | FIRST FLOOR PLAN ELECTRICAL SECURITY PLAN | |
| E3.6 | ROOF ELECTRICAL PLAN | |
| E3.7 | ROOF ELECTRICAL LIGHTING PROTECTION PLAN | |

1.3 SUMMARY

- A. Section includes:
 - 1. Glass for interior borrowed lites, glazed curtain walls.
- B. Related Requirements:

- 1. Section 084413 "Glazed Aluminum Curtain Walls" for delegated design, structural requirements, glazing gaskets, sealants and accessories used in glazed aluminum curtain walls.
- 2. Section 081416 "Flush Wood Doors" for factory-glazed glass lites.
- 3. Section 133419 "Metal Building Systems" for factory-glazed windows and doors.

1.4 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.5 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass including the following products; 12 inches square.
 - 1. Insulating glass.
 - 2. Laminated glass.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturers of insulating-glass units with sputtercoated, low-E coatings.
- B. Product Certificates: For glass.
- C. Product Test Reports: For coated glass and insulating glass, for tests performed by a qualified testing agency.
- D. Sample Warranties: For special warranties.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.9 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
 - 1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 - 2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - 3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 - 4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
 - 5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.12 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Guardian Industries Corp.; SunGuard.
 - 2. PPG Industries, Inc.
 - 3. Vetrotech Saint-Gobain.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

- 1. Obtain tinted glass from single source from single manufacturer.
- 2. Obtain reflective-coated glass from single source from single manufacturer.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Occupancy Category: This building is assigned to Occupancy Category IV as defined in ASCE 7, Table 1.1 and Massachusetts State Building Code 8th Edition, Table 1604.5 as an essential facility "for designated emergency preparedness, communications and operations centers and other facilities required for emergency response."
- C. Delegated Design: See Section 084413 "Glazed Aluminum Curtain Walls."
- D. Structural Performance: See Section 084413 "Glazed Aluminum Curtain Walls."
- E. Windborne-Debris-Impact Resistance: Exterior glazing shall comply with enhancedprotection testing requirements in ASTM E 1996 for Wind Zone 2 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on Project and shall be installed in same manner as glazing indicated for use on Project.
 - 1. Large-Missile Test: For glazing located within 30 feet of grade.
 - 2. Small-Missile Test: For glazing located more than 30 feet above grade.
- F. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- G. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 - 1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
 - 2. For laminated-glass lites, properties are based on products of construction indicated.
 - 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 - 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 - 5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 - 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: "Glazing Manual."
 - 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IgCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
 - 1. Minimum Glass Thickness for Exterior Lites: 6 mm.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heatstrengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Pyrolytic-Coated, Low-Maintenance Glass: Clear float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.

2.5 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Construction: Laminate glass with polyvinyl butyral interlayer, ionomeric polymer interlayer, or cast-in-place and cured-transparent-resin interlayer to comply with interlayer manufacturer's written instructions.
 - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 3. Interlayer Color: Clear unless otherwise indicated.
- B. Windborne-Debris-Impact-Resistant Laminated Glass: Comply with requirements specified above for laminated glass except laminate glass with one of the following to comply with interlayer manufacturer's written instructions:
 - 1. Polyvinyl butyral interlayer.
 - 2. Polyvinyl butyral interlayers reinforced with polyethylene terephthalate film.
 - 3. Ionomeric polymer interlayer.
 - 4. Cast-in-place and cured-transparent-resin interlayer.
 - 5. Cast-in-place and cured-transparent-resin interlayer reinforced with polyethylene terephthalate film.

2.6 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants, black color.
 - 2. Spacer: Manufacturer's standard spacer material and construction, black color.
 - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.7 GLAZING SEALANTS

- A. General: Utilize as required by glazed aluminum curtain wall assembly.
 - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

- 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
- 3. Sealant shall have a VOC content of 250 g/L or less.
- 4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920:
 - 1. Type S.
 - 2. Grade NS.
 - 3. Class as recommended by manufacturer.
 - 4. Use NT.

2.8 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.10 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

- 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.7 MONOLITHIC GLASS SCHEDULE

- A. Glass Type GL-2: Clear fully tempered float glass.
 - 1. Minimum Thickness: 6 mm.
 - 2. Safety glazing required.

3.8 INSULATING GLASS SCHEDULE

- A. Glass Type GL-1: Pyrolytic-coated, self-cleaning, low-maintenance, low-E coated, clear insulating glass.
 - 1. Basis-of-Design Product: Saint-Gobain Corporation; Bioclean Cool-Lite.
 - 2. Overall Unit Thickness: 1 inch.
 - 3. Minimum Thickness of Each Glass Lite: As required to meet performance criteria.
 - 4. Outdoor Lite: Pyrolytic-coated, self-cleaning, low-maintenance, clear fully tempered float glass.
 - 5. Interspace Content: Argon.
 - 6. Indoor Lite: Fully tempered float glass.
 - 7. Low-E Coating: Sputtered on second surface.
 - 8. Safety glazing required.
 - 9. Windborne-Debris-Impact-Resistant Laminated Glass: Utilize as required to meet performance criteria.

END OF SECTION 088000

SECTION 092900 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum wallboard.
 - 2. Non-load-bearing steel framing.
 - 3. Concealed wood blocking, furring and grounds.
 - 4. Vapor barrier.
 - 5. Sealants.

1.3 DEFINITIONS

A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- 1.5 QUALITY ASSURANCE
 - A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory."

1.6 STRUCTURAL LOADS

- 1.7 Horizontal loads: 5 pounds per square foot on partitions.
- 1.8 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Steel Framing and Furring:
 - a. MarinoWare; Division of Ware Ind.
 - b. National Gypsum Company.
 - c. Unimast, Inc.
 - 2. Gypsum Board and Related Products:
 - a. G-P Gypsum Corp.
 - b. National Gypsum Company.
 - c. United States Gypsum Co.

2.2 LIGHT GAGE METAL FRAMING

- A. Components, General: As follows:
 - 1. Comply with ASTM C 754 for conditions indicated.
 - 2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with manufacturer's standard corrosion-resistant zinc coating.
- B. Steel Studs and Runners: ASTM C 645.
 - 1. Minimum Base Metal Thickness: 0.027-inch-thickness (22 gage, nominal).
 - 2. Base Metal Thickness at Door Frames: 0.033-inch-thickness (20 gage, nominal) for studs at door frames supporting standard and heavy-weight doors.
 - 3. Depth: As indicated.
- C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base Metal Thickness: 0.033-inch-thickness (20 gage, nominal).

D. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.3 INTERIOR GYPSUM WALLBOARD

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Gypsum Wallboard: ASTM C 36.
 - 1. Type X:
 - a. Abuse Resistant, Level 2.
 - b. Thickness: 5/8 inch.
 - c. Long Edges: Tapered.
 - d. Location: Typical, unless otherwise noted.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 - 2. Shapes:
 - a. Cornerbead: Use at outside corners.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475.
- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Paper.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - a. Typical final coat, unless otherwise indicated.

5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.6 FIRE-RETARDANT, REINFORCED-POLYETHYLENE VAPOR RETARDERS

- A. Fire-Retardant, Reinforced-Polyethylene Vapor Retarders: Sheet with outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nonwoven grid of nylon cord or polyester scrim and weighing not less than 20 lb/1000 sq. ft., with maximum permeance rating of 0.1 perm.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Raven Industries, Inc., Dura-Scrim 2FR.
 - 2. Surface-Burning Characteristics: Flame-spread and smoke-developed indexes of 5 and 20, respectively, per ASTM E 84.

2.7 ACOUSTICAL SEALANT

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
 - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
 - 2. Acoustical Sealant for Concealed Joints:
 - a. Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
 - b. Pecora Corp.; BA-98.
 - c. Tremco, Inc.; Tremco Acoustical Sealant.
- B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- C. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

2.8 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
- E. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vaporretarder manufacturer for sealing joints and penetrations in vapor retarder.
- F. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.
- G. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.
- H. Miscellaneous Lumber: Provide lumber for support or attachment of other construction, including blocking, furring and grounds.
 - 1. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 15 percent maximum moisture content of any softwood species.
 - 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.
 - 3. For wood in contact with masonry or concrete, provide pressure-treated material with 15 percent maximum moisture content.
 - 4. For concealed blocking, furring and grounds, provide fire-retardant-treated material with 15 percent maximum moisture content.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLING STEEL FRAMING, GENERAL

- A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

3.3 INSTALLING STEEL PARTITION FRAMING

- A. Install tracks (runners) at floors, concrete knee wall, wall and roof framing members and where gypsum board assemblies abut other construction.
 - 1. Do not attach framing to roof or wall panels.
- B. Extend partition framing to height indicated. Continue framing over frames for doors and openings and frame around ducts penetrating partitions to provide support for gypsum board.
 - 1. Deflection Assembly: Where partitions are indicated to extend to underside of roof, attach deep leg track directly to bottom flange of primary framing or perpendicular to secondary framing. Extend studs loose into track one inch deep. Attach 6-inch wide flat metal across studs to stabilize the assembly.
- C. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.
- D. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - 1. Install two 20-gage studs at each jamb, unless otherwise indicated.
- E. Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

3.4 WOOD BLOCKING, FURRING AND GROUNDS

- A. Install concealed lumber for support or attachment of other construction.
- B. Coordinate placement with installers of other construction. Refer to approved shop drawings where applicable.

3.5 INSTALLATION OF VAPOR RETARDERS ON FRAMING

- A. Place vapor retarders on side of construction indicated on Drawings.
- B. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer.
 - 1. Extend to top of floor slab.
 - 2. Extend to underside of roof insulation facing.
 - 3. Extend to hollow metal door and borrowed lite frames.

- C. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.
- D. Seal joints caused by roof purlins, pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- E. Protect vapor retarders from damage until concealed by permanent construction.
- F. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.
- 3.6 APPLYING AND FINISHING PANELS, GENERAL
 - A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.
 - B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
 - C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
 - D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
 - E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
 - F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
 - G. Attach gypsum panels to framing provided at openings and cutouts.
 - H. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

- I. Isolate perimeter of non-load-bearing gypsum board partitions at existing abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations, and trim edges with LC-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- J. Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
- K. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
 - 1. Space screws a maximum of 12 inches o.c. for vertical applications.

3.7 PANEL APPLICATION METHODS

- A. Single-Layer Application:
 - 1. On partitions/walls, apply gypsum panels vertically (parallel to framing) or horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of board.
 - b. At high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
- B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.8 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
 - 1. Level 1: At joints and interior angles, embed the tape in the joint compound. Panel surfaces must be free of excess joint compound, but tool marks and ridges are acceptable.
 - a. Not used.
 - 2. Level 2: At joints and interior angles, embed the tape in the joint compound and immediately apply the joint compound over the tape. Apply one coat of the joint compound on fastener heads and flanges of trim accessories. Panel surfaces must be free of excess joint compound, but tool marks and ridges are acceptable.
 - a. Panels not exposed to view, above ceilings and in concealed areas.
 - b. Painting contractor shall apply "drywall primer" to seal surfaces left exposed in concealed locations and prior to furring installation for other finishes.
 - 3. Level 3: At joints and interior angles, embed the tape in the joint compound and immediately apply the joint compound over the tape. Apply one additional coat of the joint compound over the tape. Apply two separate coats of the joint compound over fastener heads and flanges of trim accessories. Panel surfaces and the joint compound must be smooth and free of tool marks and ridges.
 - a. Panels in utility rooms, storage rooms, closets.
 - 4. Level 4: At joints and interior angles, embed the tape in the joint compound and immediately apply the joint compound over the tape. Apply two additional separate coats of the joint compound over flat joints. Apply one additional coat of the joint compound over interior angles. Apply three separate coats of the joint compound over fastener heads and flanges of trim accessories. Panel surfaces and the joint compound must be smooth and free of tool marks and ridges.
 - a. Provide Finish Level 4, typical, unless otherwise indicated.
 - 5. Level 5: Finish must be equal to Level 4 (embedding coat and three finish coats) plus a skim coat over the entire gypsum board surface. Surfaces must be smooth and free of tool marks and ridges.
 - a. Room 01E ENTRY: All vertical and horizontal surfaces.
 - b. Rooms 01MS SHOWER, 01WS SHOWER: Ceilings.

END OF SECTION 092900

SECTION 095113 - ACOUSTICAL PANEL CEILINGS (FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:

A. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors". The following shall appear on the upper left hand of the envelope:

 Name of Sub-Bidder:
 Print Name of Sub-bidder

 Project:
 REGIONAL EMERGENCY COMMUNICATIONS CENTER

 Sub-Bid for Section:
 095113 - ACOUSTICAL PANEL CEILINGS

- B. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 in person, or by written request.
- C. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.
- D. Additional Requirements:
 - 1. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:
 - 2. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is

qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

| Class of Work | Reference Specification | Paragraphs |
|---------------|-------------------------|------------|
| | | |
| | | |
| | | |

E. The work done by this sub-bidder is shown on the following drawings:

| T1.0 | TITLE SHEET |
|-----------------|--|
| | |
| CIVIL | |
| C1 | EXISTING CONDITIONS |
| C2 | DEMOLITION PLAN |
| C3 | EROSION AND SEDIMENT CONTROL |
| C4.1 | SITE PLAN – BASE BID |
| C4.2 | SITE PLAN – ALTERNATES |
| C5 | DRAINAGE AND UTILITIES |
| C6 | DETAILS |
| | |
| ARCHITECTURAL | |
| D1.0 | DEMOLITION PLAN-EXISTING PLAN & ELEVATIONS |
| A1.0 | EXISTING FOUNDATION WORK PLAN & DETAILS |
| A1.1 | FLOOR PLAN & DETAILS |
| A1.2 | FIRST FLOOR PLAN - ENLARGED |
| A1.3 | ROOF PLAN & DETAILS |
| A1.4 | COVERED TRAILER STORAGE |
| A2.1 | ELEVATIONS |
| A3.1 | BUILDING SECTIONS |
| A4.1 | WALL SECTIONS |
| A4.2 | WALL SECTIONS |
| A5.1 | SECTION DETAILS |
| A6.1 | INTERIOR ELEVATIONS |
| A6.2 | INTERIOR ELEVATIONS |
| A6.3 | INTERIOR ELEVATIONS |
| A7.1 | REFLECTED CEILING PLANS |
| A8.1 | SCHEDULES & DETAILS |
| | |
| FIRE PROTECTION | I |
| FP0.1 | FIRE PROTECTION LEGEND, NOTES & DETAILS |
| FP0.2 | FIRE PROTECTION DETAILS |
| FP2.0 | FIRE PROTECTION DEMOLITION PLAN |
| FP3.1 | FIRE PROTECTION FLOOR PLANS |
| | |

| PLUMBING | | |
|------------|---|--|
| P0.1 | PLUMBING LEGEND, NOTES & SCHEDULES | |
| P0.2 | PLUMBING DETAILS | |
| P2.0 | PLUMBING DEMOLITION PLAN | |
| P3.1 | PLUMBING FLOOR PLANS | |
| P3.2 | PLUMBING FLOOR PLANS | |
| | | |
| HVAC | · | |
| H0.1 | HVAC LEGEND & GENERAL NOTES | |
| H0.2 | HVAC LEGEND & GENERAL NOTES | |
| H0.3 | HVAC SCHEDULES | |
| H0.4 | HVAC DETAILS | |
| H0.5 | HVAC DETAILS | |
| H0.6 | HVAC CONTROLS | |
| H1.1 | HVAC DEMOLITION PLAN | |
| H2.1 | HVAC LEVEL 1 FLOOR PLAN | |
| H2.2 | HVAC ROOF PLAN | |
| | | |
| ELECTRICAL | | |
| E0.1 | ELECTRICAL LEGEND AND NOTES | |
| E0.2 | ELECTRICAL SYSTEMS RISER DIAGRAMS | |
| E0.3 | ELECTRICAL SYSTEMS RISER DIAGRAMS | |
| E0.4 | ELECTRICAL SCHEDULES | |
| E0.5 | ELECTRICAL DETAILS | |
| E0.6 | ELECTRICAL DETAILS | |
| E1.0 | ELECTRICAL SITE PLAN | |
| E2.0 | FIRST FLOOR PLAN ELECTRICAL DEMOLITION | |
| E3.0 | FIRST FLOOR PLAN LIGHTING PLAN | |
| E3.1 | FIRST FLOOR PLAN ELECTRICAL POWER PLAN | |
| E3.2 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART | |
| | PLAN | |
| E3.3 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART | |
| | PLAN | |
| E3.4 | FIRST FLOOR PLAN ELECTRICAL FIRE ALARM PLAN | |
| E3.5 | FIRST FLOOR PLAN ELECTRICAL SECURITY PLAN | |
| E3.6 | ROOF ELECTRICAL PLAN | |
| E3.7 | ROOF ELECTRICAL LIGHTING PROTECTION PLAN | |

1.3 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings.

1.4 DEFINITIONS

- A. CAC: Ceiling Attenuation Class.
- B. LR: Light Reflectance coefficient.

- C. NRC: Noise Reduction Coefficient.
- 1.5 REFERENCES
 - A. ISO 354, 10534, 17497-1
 - B. AES-4id-2001
 - C. ASTM E 1050-98, ASTM C 423, ASTM E 84

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For components with factory-applied color finishes.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch-square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch-long Samples of each type, finish, and color.
- D. Qualification Data: For testing agency.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
- F. Research/Evaluation Reports: For each acoustical panel ceiling and components and anchor and fastener type.
- G. Maintenance Data: For finishes to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain through one source from a single manufacturer.
 - 2. Suspension System: Obtain through one source from a single manufacturer.
 - 3. Provide Ceiling Panel and Suspension System from a single manufacturer, where required for performance warranty.
- B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

- a. Flame Spread Index: 25 or less.
- b. Smoke-Developed Index: 450 or less.
- C. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 - 1. MA State Building Code, 8th Edition.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.10 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.11 WARRANTY

- A. ACT: Manufacturer's 30 year lifetime system warranty against visible sag, mold, and mildew.
- B. Suspension system: Manufacturer's 30 year lifetime system warranty against manufacturing defects and rust.
- C. Installer's One year warranty against defects in installation, from time of substantial completion.

1.12 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
 - 3. Hold-Down Clips: Equal to 2 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- A. Recycled Content: none required.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
- C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- D. Antimicrobial Fungicide Treatment: Provide acoustical panels with face and back surfaces coated with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.
- E. Sag: Acoustic panels are to not exhibit any visible sag over their lifetime.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product, ACT-1: Subject to compliance with requirements, provide Armstrong #1754, Fine Fissured Open Plan, Square lay-in, medium texture; 2'x2'x7/8", High NRC/High CAC, No VOC, or a comparable product by one of the following:
 - 1. Ecophone CertainTeed, Inc.
 - 2. United States Gypsum

- 3. Approved equal.
- C. Classification: Provide Class A-rated panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type / Form / Pattern, ACT 1: Type III, Form 1; Pattern CE.
- D. Color:
 - 1. White at ACT-1, 2, 3, 4, & 5.
- E. Light Reflectance:
 - 1. ACT 1: Not less than 0.85
- F. Noise Reduction Coefficient / Ceiling Attenuation Class:
 - 1. ACT 1: Not less than 0.75 / 35
- G. Modular Size x Thickness; Edge Profile:
 - 1. ACT 1: 2' x 2' x 7/8"; square edge
- H. Antimicrobial Treatment: Fungicide based.
- I. Sag Resistance: ACT shall be classified as sag and humidity resistant.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Provide manufacturer's standard factory-applied finish for type of system indicated for ACT-1.
 - 2. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" at high-humidity locations: shower rooms, locker rooms, kitchen, serving area, receiving, recycling.
- D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

- 1. Anchors in Concrete, where applicable: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Post-installed expansion anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 for Class SC 1 service condition.
- 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.
- F. Hanger Rods, Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- G. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90coating designation; with bolted connections and 5/16-inch-diameter bolts.
- H. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- I. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- J. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.
- K. Hold-Down Clips: Where indicated, provide manufacturer's standard hold-down clips spaced 24 incheso.c. on all cross tees.
- L. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

- 1. Basis-of-Design Product, standard system: Subject to compliance with requirements, provide USG Donn #DX/DXL24 at ACT-1, or a comparable product by one of the following:
 - 1) Armstrong World Industries, Inc.
 - 2) Ecophone CertainTeed, Inc.
 - 3) Fry Reglet Corporation
 - 4) BPB USA
 - 5) Chicago Metallic Corporation
 - 6) Approved equal.
 - b. Color:
 - 1) White at Metal Suspension Systems for: ACT-1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

- 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
- 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
- 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
- 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
- 6. Fasten hangers to post installed mechanical anchors, or power-actuated fasteners that extend through steel decking into concrete.
- 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
- 8. When steel framing does not permit installation of hanger wires at spacing required, the Acoustical Ceiling Contractor shall install carrying channels or other supplemental support for attachment of hanger wires.
- 9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
- 10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Screw attach moldings to substrate at intervals not more than 16 incheso.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans; or with grain parallel if not otherwise indicated.
 - 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
- 3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
- 4. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09513

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Surface preparation of substrates in accordance with manufacturer's guidelines.
 - 2. Resilient base, to be provided as scheduled.
 - 3. Resilient molding accessories, to be provided as indicated.
 - 4. Complete installation.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated, in manufacturer's standardsize Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.
- D. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
 - 2. Flame spread: Max. 75 per ASTM E84
 - 3. Smoke Developed: Max. 450 per ASTM E84

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg For more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide:
 - 1. Roppe Pinnacle Wall Base Type TS, or a comparable product by one of the following:
 - a. Flexco, Inc.
 - b. Johnsonite.
- C. Resilient Base Standard: ASTM F 1861.
 - 1. Material Requirement: Vulcanized SBR rubber
 - 2. Manufacturing Method: Group I (solid, homogeneous).
 - 3. Style: Standard Cove for resilient flooring and bare concrete.
 - 4. Style: Standard No-Toe for carpet and access flooring.
- D. Minimum Thickness: 0.125 inch.

- E. Height: 4 inches.
- F. Lengths: Coils in manufacturer's standard length.
- G. Outside Corners: Job formed.
- H. Inside Corners: Job formed.
- I. Finish: Satin.
- J. Colors and Patterns: As selected by Architect from full range of industry colors.

2.2 RESILIENT MOLDING ACCESSORY

- A. Resilient Molding Accessory:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Roppe Corporation, USA.
 - b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
 - c. Flexco, Inc.
 - d. Johnsonite.
 - e. Nora
- B. Description: Reducer strip for resilient floor covering, transition strips.
- C. Material: Rubber.
- D. Profile and Dimensions: Manufacturer's standard profile for heavy duty applications.
- E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Cove Base Adhesives: Not more than 50 g/L.
 - b. Rubber Floor Adhesives: Not more than 60 g/L.

- C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.
- D. Floor Polish: Provide protective liquid floor polish products as recommended by resilient stair tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are same temperature as the space where they are to be installed.

- 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.

- 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 099100 – PAINTING (FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:

A. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors". The following shall appear on the upper left hand of the envelope:

Name of Sub-Bidder:Print Name of Sub-bidderProject:REGIONAL EMERGENCY COMMUNICATIONS CENTERSub-Bid for Section:099100 - PAINTING

- B. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 in person, or by written request.
- C. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.
- D. Additional Requirements:
 - 1. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:
 - 2. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is

qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

| Class of Work | Reference Specification | Paragraphs |
|---------------|-------------------------|------------|
| | | |
| | | |
| | | |

E. The work done by this sub-bidder is shown on the following drawings:

| T1.0 | TITLE SHEET | |
|-----------------|--|--|
| | | |
| CIVIL | | |
| C1 | EXISTING CONDITIONS | |
| C2 | DEMOLITION PLAN | |
| C3 | EROSION AND SEDIMENT CONTROL | |
| C4.1 | SITE PLAN – BASE BID | |
| C4.2 | SITE PLAN – ALTERNATES | |
| C5 | DRAINAGE AND UTILITIES | |
| C6 | DETAILS | |
| | | |
| ARCHITECTURAL | | |
| D1.0 | DEMOLITION PLAN-EXISTING PLAN & ELEVATIONS | |
| A1.0 | EXISTING FOUNDATION WORK PLAN & DETAILS | |
| A1.1 | FLOOR PLAN & DETAILS | |
| A1.2 | FIRST FLOOR PLAN - ENLARGED | |
| A1.3 | ROOF PLAN & DETAILS | |
| A1.4 | COVERED TRAILER STORAGE | |
| A2.1 | ELEVATIONS | |
| A3.1 | BUILDING SECTIONS | |
| A4.1 | WALL SECTIONS | |
| A4.2 | WALL SECTIONS | |
| A5.1 | SECTION DETAILS | |
| A6.1 | INTERIOR ELEVATIONS | |
| A6.2 | INTERIOR ELEVATIONS | |
| A6.3 | INTERIOR ELEVATIONS | |
| A7.1 | REFLECTED CEILING PLANS | |
| A8.1 | SCHEDULES & DETAILS | |
| | | |
| FIRE PROTECTION | | |
| FP0.1 | FIRE PROTECTION LEGEND, NOTES & DETAILS | |
| FP0.2 | FIRE PROTECTION DETAILS | |
| FP2.0 | FIRE PROTECTION DEMOLITION PLAN | |
| FP3.1 | FIRE PROTECTION FLOOR PLANS | |
| | | |

| PLUMBING | | |
|------------|---|--|
| P0.1 | PLUMBING LEGEND, NOTES & SCHEDULES | |
| P0.2 | PLUMBING DETAILS | |
| P2.0 | PLUMBING DEMOLITION PLAN | |
| P3.1 | PLUMBING FLOOR PLANS | |
| P3.2 | PLUMBING FLOOR PLANS | |
| | | |
| HVAC | | |
| H0.1 | HVAC LEGEND & GENERAL NOTES | |
| H0.2 | HVAC LEGEND & GENERAL NOTES | |
| H0.3 | HVAC SCHEDULES | |
| H0.4 | HVAC DETAILS | |
| H0.5 | HVAC DETAILS | |
| H0.6 | HVAC CONTROLS | |
| H1.1 | HVAC DEMOLITION PLAN | |
| H2.1 | HVAC LEVEL 1 FLOOR PLAN | |
| H2.2 | HVAC ROOF PLAN | |
| | | |
| ELECTRICAL | | |
| E0.1 | ELECTRICAL LEGEND AND NOTES | |
| E0.2 | ELECTRICAL SYSTEMS RISER DIAGRAMS | |
| E0.3 | ELECTRICAL SYSTEMS RISER DIAGRAMS | |
| E0.4 | ELECTRICAL SCHEDULES | |
| E0.5 | ELECTRICAL DETAILS | |
| E0.6 | ELECTRICAL DETAILS | |
| E1.0 | ELECTRICAL SITE PLAN | |
| E2.0 | FIRST FLOOR PLAN ELECTRICAL DEMOLITION | |
| E3.0 | FIRST FLOOR PLAN LIGHTING PLAN | |
| E3.1 | FIRST FLOOR PLAN ELECTRICAL POWER PLAN | |
| E3.2 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART | |
| | PLAN | |
| E3.3 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART | |
| | PLAN | |
| E3.4 | FIRST FLOOR PLAN ELECTRICAL FIRE ALARM PLAN | |
| E3.5 | FIRST FLOOR PLAN ELECTRICAL SECURITY PLAN | |
| E3.6 | ROOF ELECTRICAL PLAN | |
| E3.7 | ROOF ELECTRICAL LIGHTING PROTECTION PLAN | |

1.3 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following:

- Steel doors and frames. 1.
- 2.
- Gypsum drywall. Structural framing. 3.
- Metal fabrications. 4.

- B. Do not paint prefinished items, metal building components except as indicated, concealed surfaces except as indicated, finished metal surfaces, glass, ceramic tile, stone, operating parts, and labels.
 - 1. Prefinished items include the following:
 - a. Window, storefront and curtain wall frames.
 - b. Louvers.
 - c. Mechanical equipment housings and cabinets.
 - d. Electrical equipment housings and cabinets.
 - 2. Metal building components that are prefinished or field finished as work of Section 133419-Metal Building Systems.
 - a. Paint exposed metal building structure at southeast corner of building.
 - 3. Prime paint concealed drywall surfaces. See Section 092900-Gypsum Board Assemblies.
 - 4. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
 - 5. Labels include code-required labels or identification, performance rating, or nomenclature plates.

1.4 **DEFINITIONS**

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 - 3. Semi-gloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.5 SUBMITTALS

- A. Product Data: For each paint system indicated. Include fillers and primers.
 - 1. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. Qualification Data: For Applicator.

1.6 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain primers for each coating system from the same manufacturer as the finish coats.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
 - 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.8 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
- C. Do not apply paint when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:
 - 1. Benjamin Moore & Co. (Benjamin Moore).
 - 2. PPG Industries, Inc. (Pittsburgh Paints).
 - 3. Sherwin-Williams Co. (Sherwin-Williams).

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
- D. Colors: As selected by Architect from manufacturer's full range.

2.3 PRIMERS

- A. Primer Sealer, Latex, Interior: MPI #50.
 - 1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer 253.
- B. Primer, Rust-Inhibitive, Water Based: MPI #107.
 - 1. Benjamin Moore; Super Spec HP Acrylic Metal Primer P04.
- C. Primer, Rust-Inhibitive, Alkyd: MPI #135.

2.4 FINISH COATS

A. Latex, Interior, Eggshell (Gloss Level 2): MPI #44.

- 1. Benjamin Moore; Moorcraft Super Hide Latex Eggshell Enamel C286.
- B. Latex, Interior, Semi-Gloss, (Gloss Level 5): MPI #54.
 - 1. Benjamin Moore; Super Spec Latex Semi-Gloss Enamel 276.
- C. Exterior Alkyd Enamel, Gloss, (Gloss Level 6): MPI #9.
 - 1. Benjamin Moore; Super Spec HP Urethane Alkyd Gloss Enamel P22.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
 - 1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible shop-applied prime coats or remove and reprime.

- 2. Ferrous Metals: Hand tool clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, non-adherent rust, scaling paint and other foreign substances.
 - a. Treat adherent rust with rust stabilizer before priming.
 - b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
- 3. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 - 3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
 - 1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
 - 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 - 3. Provide finish coats that are compatible with primers used.
 - 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, covers and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
 - 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 6. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 - 7. Prime paint concealed drywall surfaces.
 - 8. Paint exposed interior metal building framing.
 - 9. Paint exposed exterior metal building framing.
 - 10. Paint exposed fire protection, mechanical and electrical work.
 - 11. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

- 1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
- 2. Omit primer over metal surfaces that have been shop primed and touchup painted.
- 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
- 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply finish coatings by brush, roller or spray according to manufacturer's written instructions.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Fire Protection, Mechanical and Electrical Work: Painting of fire protection, mechanical and electrical work is limited to items exposed in occupied spaces. Items to be painted include, but are not limited to, the following:
 - 1. Equipment that is indicated to have a factory-primed finish for field painting.
 - 2. Exposed sprinkler piping and hangers.
 - 3. Exposed conduits, junction and device boxes.
- F. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- G. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:

- 1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
- 2. Testing agency will perform appropriate tests for the following characteristics as required by Owner:
 - a. Actual material content.
 - b. Dry film thickness.
 - c. Abrasion resistance.
 - d. Accelerated weathering.
 - e. Alkali resistance.
 - f. Color retention.
 - g. Dry opacity.
 - h. Flexibility.
 - i. Mildew resistance.
- 3. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. At interior locations, provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 OPAQUE FINISH SCHEDULE

- A. Ferrous Metals (non-galvanized): Provide the following painted finishes over nongalvanized interior metal fabrications, doors and frames, metal fabrications, louvers and other iron and steel items.
 - 1. Semi-gloss Finish: Two finish coats over primer.
 - a. Prime Coat: Rust-inhibitive alkyd primer. Touch-up shop primed items.
 - b. Finish Coats: Interior semi-gloss coating.
 - c. Color: Match Architect's sample.
- B. Ferrous Metals (galvanized): Provide the following painted finishes over exposed galvanized metal fabrications and metal building structure.
 - 1. Semi-gloss Finish: Two finish coats over primer.
 - a. Prime Coat: Rust-inhibitive water-based primer.
 - b. Finish Coats: Exterior urethane alkyd enamel coating.
 - c. Color: Match Architect's sample.
- C. Interior Drywall: Provide the following painted finishes over interior gypsum board surfaces:
 - 1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.
 - a. Primer: Interior latex primer/sealer.
 - b. Finish Coats: Interior latex eggshell enamel.
 - c. Color: Match Architect's sample.

END OF SECTION 099100

SECTION 102113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-polymer toilet compartments configured as toilet enclosures.
- B. Related Sections:
 - 1. Division 10 Section "Toilet Accessories" for compartment mounted toilet tissue dispensers, coat hook and similar accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of cutouts for compartment-mounted toilet accessories.
 - 2. Show locations of reinforcements for compartment-mounted grab bars.
 - 3. Show locations of centerlines of toilet fixtures.
- C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
 - 1. Each type of material, color, and finish required for units, prepared on 6-inch- square Samples of same thickness and material indicated for Work.
 - 2. Each type of hardware and accessory.
- E. Product Certificates: For each type of toilet compartment, from manufacturer.
- F. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency. Solid polymer materials shall meet or exceed Class B as follows:
 - 1. Flame-Spread Index: 75 or less.
 - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in 521 CMR, the Rules and Regulations of the Massachusetts Architectural Access Board for toilet compartments designated as accessible.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: ASTM B 221.
- C. Brass Castings: ASTM B 584.
- D. Brass Extrusions: ASTM B 455.
- E. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.
 - 1. Electrolytically Zinc Coated: ASTM A 879/A 879M, 01Z.
 - 2. Hot-Dip Galvanized: ASTM A 653/A 653M, either hot-dip galvanized or galvannealed.
- F. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- G. Stainless-Steel Castings: ASTM A 743/A 743M.
- H. Zamac: ASTM B 86, commercial zinc-alloy die castings.

2.2 SOLID-POLYMER UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. General Partitions.
 - 2. Global Partitions.
 - 3. Scranton Products.
- B. Toilet-Enclosure Style: Overhead braced.
- C. Door, Panel and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
 - 1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
 - 2. Heat-Sink Strip (Optional): Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-polymer components to prevent burning.
 - 3. Color: One color orange-peel texture as selected by Architect from manufacturer's full range.
- D. Pilaster Shoes: Manufacturer's standard design; stainless steel.
- E. Brackets (Fittings):
 - 1. Stirrup Type: Ear or U-brackets, stainless steel.

2.3 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
 - 1. Material: Non-ferrous with satin chrome, satin stainless or clear anodized finish.
 - 2. Hinges: Integral.
 - 3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
 - 4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount to partition, not door.
 - 5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging and in-swinging doors.
 - 6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile; clear anodized finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of aluminum, stainless steel or chrome-plated brass selected to reduce galvanic corrosion, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel.

2.4 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, in-swinging doors for standard toilet compartments and 36-inch- wide, out-swinging doors with a minimum 32-inch- wide, clear opening for accessible compartments.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch.
 - b. Panels and Walls: 1 inch.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and doors in entrance screens to return doors to fully closed position.

END OF SECTION

SECTION 102800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Custodial accessories.
 - 3. Warm air hand dryers.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Manufacturer's warranty.

1.4 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamperand-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Manufacturers: Basis of Design: Bobrick Washroom Equipment or subject to compliance with requirements, provide products by one of the following:
 - 1. American Specialties, Inc.
 - 2. Bradley Corporation.
 - 3. Tubular Specialties Manufacturing, Inc.
- B. Toilet Tissue Dispenser.
 - 1. Basis-of-Design Product: Bobrick B-2888.
 - 2. Description: Stainless Steel double-roll dispenser
 - 3. Mounting: Surface-mounted.
 - 4. Operation: Noncontrol delivery with theft-resistant spindle.
 - 5. Capacity: Designed for 5-inch- diameter tissue rolls.
 - 6. Material and Finish: Stainless steel, No. 4 finish (satin).
- C. Towel Bars:
 - 1. Basis-of-Design Product: Bobrick.
 - 2. Description: Stainless steel wall-mounted type, 24-inch long.

- D. Grab Bars:
 - 1. Basis-of-Design Product: Bobrick Series Concealed Mounting with Snap Flange Grab Bars: B-5806.99x42
 - 2. Mounting: Flanges with concealed fasteners.
 - 3. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
 - 4. Outside Diameter: 1-1/4 inches.
 - 5. Configuration and Length: Straight, 42 inches long.
- E. Sanitary-Napkin Disposal Unit:
 - 1. Basis-of-Design Product: Bobrick, B-254
 - 2. Mounting: Surface-mounted.
 - 3. Door or Cover: Self-closing, disposal-opening cover.
 - 4. Receptacle: Removable.
 - 5. Material and Finish: Stainless steel, No. 4 finish (satin).
- F. Waste receptacle:
 - 1. Basis-of-Design Product: Bobrick, B-279
 - 2. Mounting: Surface-mounted.
 - 3. Receptacle: Liner-heavy gauge vinyl-removable.
 - 4. Material and Finish: Stainless steel, No. 4 finish (satin).
- G. Paper towel dispenser:
 - 1. Basis-of-Design Product: Bobrick, B-262
 - 2. Mounting: Surface-mounted.
 - 3. Door: Secured to cabinet with piano-hinge; equipped with tumbler lock.
 - 4. Optional: Include TowelMate accessory.
 - 5. Material and Finish: Stainless steel, No. 4 finish (satin).
- H. Soap dispenser:
 - 1. Basis-of-Design Product: Bobrick, B-2111
 - 2. Mounting: Surface-mounted.
 - 3. Valve: Black molded plastic push button and spout.
 - 4. Cylinder: Antibacterial-soap-resistant plastic.
 - 5. Material and Finish: Stainless steel, No. 4 finish (satin).
- I. Hat and Coat hook:
 - 1. Basis-of-Design Product: Bobrick, B-6827
 - 2. Mounting: Surface-mounted..
 - 3. Material and Finish: Stainless steel, No. 4 finish (satin).
 - 4. Flange and support arm: All welded construction.
 - 5. Wall plate: Concealed 16 gauge stainless steel.

6. Provide and install (4) additional hat and coat hooks, location to be determined upon product submittal.

2.3 CUSTODIAL ACCESSORIES

- A. Mop and Broom Holder with Shelf: Provide one in each custodial closet.
 - 1. Length: 36 inches.
 - 2. Hooks: Three.
 - 3. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
 - 4. Material and Finish: Stainless steel, No. 4 finish (satin).

2.4 WARM-AIR HAND DRYERS

- A. Warm-Air Dryer: Electric wall unit.
 - 1. Basis-of-Design Product: Xlerator XL-GR; Excel Dryer Inc.,357 Chestnut St. P.O. Box 365; East Longmeadow, MA 01028; Tel: 413-525-4531
 - 2. Mounting: Recessed. Include optional kit to meet ADA protrusion requirement.
 - 3. Operation: Electronic-sensor activated with timed power cut-off switch. 30 to 40 second operation time.
 - 4. Cover Material and Finish: Zinc Die-Cast Cover, Textured Graphite.
 - 5. Electrical Requirements: Coordinate with electrical work.

2.5 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

SECTION 105113 - METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Welded corridor lockers.

1.3 SYSTEM PERFORMANCE

A. Accessibility: Lockers shall be provided in sufficient quantity with features to meet MAAB, ADA and all applicable accessibility requirements.

1.4 SUBMITTALS

- A. Product Data: Submit product data and installation instructions for metal locker units.
- B. Samples:
 - 1. Color Samples for Selection: Submit samples of manufacturer's standard colors on squares of same metal to be used for fabrication of lockers.
- C. Shop Drawings:
 - 1. Show metal lockers dimensioned in relation to adjacent surfaces.
 - 2. Show lockers in detail, method of installation, fillers, trim, base, and accessories.
 - 3. Include locker numbering sequence information.

1.4 QUALITY ASSURANCE

- A. Uniformity:
 - 1. Provide metal lockers that are standard products of single manufacturer, with interchangeable like parts.
 - 2. Include necessary mounting accessories, fittings, and fastenings by locker manufacturer.

1.5 JOB CONDITIONS

- A. Do not deliver metal lockers until building is enclosed and ready for locker installation.
- B. Protect from damage during delivery, handling, storage, and installation.

1.6 WARRANTY

A. Comprehensive one year warranty on all materials and labor, in addition to manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Lyon Metal Products Inc.
 - 2. Penco Products Inc.
 - 3. Republic Steel Corp.

2.2 MATERIALS

- A. Sheet Steel: Mild cold-rolled and leveled furniture steel, free from buckle, scale, and surface imperfections.
- C. Fasteners: Cadmium, zinc, or nickel plated steel; exposed bolt heads, slotless-type; self-locking nuts or lock washers for nuts on moving parts.
- D. Equipment: Hooks of cadmium-plated or zinc-plated steel.

2.3 FABRICATION

- A. Construction:
 - 1. Fabricate lockers square, rigid, without warp, with metal faces flat and free of dents or distortion.
 - 2. Make exposed metal edges safe to touch.
 - 3. Weld frame members together to form rigid, one-piece structure.
 - 4. Weld, bolt, or rivet other joints and connections.
 - 5. Grind exposed welds flush.
 - 6. Do not expose bolts or rivet heads on fronts of locker doors or frames.
 - 7. Frames: Fabricate of min. 16 ga. channels or min. 12 ga. angles, with continuous stop/strike formed on vertical members.
 - 8. Finishing:
 - a. Chemically pretreat metal with degreasing and phosphatizing process.
 - b. Apply powder coat, 2 mil min. finish to all surfaces, exposed and concealed, except plates and nonferrous metal.
 - 9. Color: Provide locker units in standard color selected by Architect.
 - a. Concealed parts may be manufacturer's standard neutral color.

- B. Wardrobe:
 - 1. Body:
 - a. Fabricate back, sides, top and bottom of min. 18 ga. steel sheet.
 - b. Construct sides and intermediate partitions of expanded metal welded to steel without hemming.
 - c. Provide 16 ga. perforated steel shelf in single-tier lockers.
 - 2. Door: One-piece, min. 16 ga. sheet steel, flanged at all edges, constructed to prevent springing when opening or closing, to open 180 degrees. Provide standard stamped louvers in door face, six at top and bottom.
 - 3. Reinforcing: Provide extra bracing or reinforcing on inside of doors over 15 in. wide.
 - 4. Hinges:
 - a. Heavy-duty, min. 0.050 in. thick steel, full loop, 5-knuckle, tight pin, 2 in. high.
 - b. Weld to inside of frame and secure to door with min. 2 factory-installed fasteners that are completely concealed and tamperproof when door is closed.
 - c. Provide min. 3 hinges for each door.
 - 5. Recessed Handle and Latch: Stainless steel housing to form recess for latch lifter and locking devices; non-protruding latch lifter containing strike and eye for padlock; and automatic, pry-resistant latch mechanism, as follows:
 - 6. Latching Three-point latch device, engaging frame at top, bottom, and jamb.
 - 7. Size: Single tier, 12 in. wide x 12 in. deep x 60 in. high.
- C. Locker Accessories, Typical:
 - 1. Equipment: Furnish each locker with following items, unless otherwise shown.
 - a. Single-tier Units: Hat shelf, one double-prong ceiling hook and min. 2 single-prong wall hooks.
 - 2. Number Plates:
 - a. Manufacturer's standard etched, embossed, or stamped, nonferrous metal number plates min. 3/8 in. high.
 - b. Number plates in sequence as directed by Architect.
 - c. Attach plates to each locker door, near top, centered, with min. 2 fasteners of same finish as number plate.
 - 3. Continuous Metal Base, floor mounted lockers:
 - a. Min. 20 ga. cold-rolled steel, fabricated in lengths as long as practicable to enclose base of lockers without additional fastening devices.
 - b. Flange bottoms inward 3/4 in. for stiffening.
 - c. Factory-finish metal base to match lockers.
 - 4. Continuous Sloping Tops:

- a. Min. 20 ga. sheet steel, approximately 25 deg. pitch, in lengths as long as practicable, min. 4 lockers.
- b. Provide closures at ends.
- c. Finish to match lockers.
- 5. Trim:
 - a. Provide trim at jambs and head of recessed lockers, min. 18 ga. cold-rolled steel.
 - b. Factory-finish trim to match lockers.
 - c. Secure trim to lockers with concealed fastening clips.
- 6. Filler Panels: Provide filler panels where indicated, on plans and elevations, and as required for finished appearance, min. 18-gage steel sheet, factory fabricated and finished to match locker units. Provide fillers at structural columns where shown on plans, scribing panel tight to column enclosure.
- 7. End Panels: Provide 16 ga. end panels at all exposed sides of lockers, to match finish of lockers.
- 8. Acoustical Treatment:
 - a. Firmly secure one rubber silencer in frame at each latch hook.
 - b. Nylon or plastic coatings on operating components to prevent metal-to-metal contact.
 - c. Latch to be designed to operate without rattling.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install metal lockers at locations shown in accordance with manufacturer's instructions for plumb, level, rigid, and flush installation.
- B. Space fasteners about 48 in. o.c., unless otherwise recommended by manufacturer, and apply through backup reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.
- C. Install trim, metal base, sloping top units, and metal filler panels and end panels, using concealed fasteners.
- D. Provide flush, hairline joints against adjacent surfaces.

3.2 ADJUST AND CLEAN

- A. Adjust doors and latches to operate easily without binding.
- B. Verify integral locking devices are operating properly.
- C. Touch-up marred finishes, but replace units that cannot be restored to factory-finished appearance.
- D. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 123530 - RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Break Room cabinets with solid-surface-material countertops.
 - 2. Solid-surface-material Reception counter.
 - 3. Solid-surface-material window stools.
- B. Related Sections:
 - 1. Division 11 Section "Residential Appliances" for appliances.
 - 2. Division 22 Section "Plumbing Fixtures" for sinks and plumbing fittings.

1.3 DEFINITIONS

- A. Exposed Surfaces of Cabinets: Surfaces visible when doors and drawers are closed, including visible surfaces in open cabinets or behind glass doors.
- B. Semiexposed Surfaces of Cabinets: Surfaces behind opaque doors or drawer fronts, including interior faces of doors and interiors and sides of drawers, and bottoms of wall cabinets.
- C. Concealed Surfaces of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, bottoms of drawers, ends of cabinets installed directly against and completely concealed by walls or other cabinets, and tops of wall cabinets and utility cabinets.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Cabinets.
 - 2. Solid-surface-material.
 - 3. Cabinet hardware.

- B. Shop Drawings: For cabinets and countertops. Include plans, elevations, details, and attachments to other work. Show materials, finishes, filler panels, hardware, edge and backsplash profiles, methods of joining countertops, and cutouts for plumbing fixtures.
- C. Samples for Initial Selection: For each type of material exposed to view.
- D. Samples for Verification: For the following products:
 - 1. Solid wood trim with transparent finish, 8 inches long, for each species.
 - 2. Plastic laminate for cabinet finish, 8 by 10 inches.
 - 3. Solid-surface-material, 8 by 10 inches.
 - 4. Exposed hardware, for each type of item.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified manufacturer.
- B. Product Certificates: For casework, from manufacturer.

1.6 QUALITY ASSURANCE

A. Source Limitations for Cabinets: Obtain cabinets from single source from single manufacturer.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete and dry, and temporary HVAC system is operating and maintaining temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Provide fillers and scribes to allow for trimming and fitting.
- C. Field Measurements for Countertops: Verify actual dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

- A. Coordinate layout and installation of blocking and reinforcement in partitions for support of casework.
- B. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 CABINETS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Apple Valley Woodworks, LLC., Southington, CT
 - 2. Metropolitan Cabinets & Countertops, Norwood, MA
 - 3. Serway Brothers Manufacturing, Inc., Rome, NY
- B. Quality Standard: Provide cabinets that comply with KCMA A161.1.
 - 1. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semiexposed location of each unit and showing compliance with the above standard.
 - 2. Membership in KCMA is not required.
- C. Face Style: Reveal overlay; door and drawer faces partially cover cabinet fronts.
- D. Cabinet Style: Face frame.
- E. Door and Drawer Fronts: 5/8-inch- thick, plastic-laminate-faced medium-density fiberboard, with PVC edge banding.
- F. Face Frames: 5/8-inch- thick medium-density fiberboard with plastic laminate on exposed and semiexposed surfaces.
- G. Exposed Cabinet End Finish: Plastic laminate.

2.2 CABINET MATERIALS

- A. General:
 - 1. Hardwood Lumber: Kiln dried to 7 percent moisture content.
 - 2. Softwood Lumber: Kiln dried to 10 percent moisture content.
 - 3. Hardwood Plywood: HPVA HP-1.
 - 4. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 - 5. Particleboard: ANSI A208.1, Grade M-2.
 - 6. Hardboard: ANSI A135.4, Class 1 Tempered.
- B. Exposed Materials:
 - 1. Exposed Wood Species: Manufacturer's standard domestic hardwood species.
 - a. Select materials for compatible color and grain. Do not use two adjacent exposed surfaces that are noticeably dissimilar in color, grain, figure, or natural character markings.

- b. Staining and Finish: As selected by Architect from manufacturer's full range.
- 2. Plastic Laminate: Particleboard faced with high-pressure decorative laminate complying with NEMA LD 3, Grade HGL.
 - a. Where edges of solid-color plastic-laminate sheets will be visible after fabrication, provide through-color plastic laminate.
 - b. Colors, Textures, and Patterns: As selected by Architect from cabinet manufacturer's full range.
- 3. PVC Edge Molding: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts, and 1 mm thick elsewhere.
 - a. Color: As selected by Architect from cabinet manufacturer's full range.
- C. Semiexposed Materials: Unless otherwise indicated, provide the following:
 - 1. Plastic Laminate: Medium-density fiberboard faced with high-pressure decorative laminate complying with NEMA LD 3, Grade VGS.
 - a. For backs of doors and drawer fronts faced with plastic laminate, provide same grade, pattern, color, and texture of plastic laminate as for faces.
 - b. For face frames faced with plastic laminate, provide plastic-laminate edges of same grade, pattern, color, and texture of plastic laminate as for faces.
 - c. For shelves faced with plastic laminate, provide PVC edge molding 1 mm thick.
 - d. Colors, Textures, and Patterns: As selected by Architect from cabinet manufacturer's full range.
- D. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility; particleboard; medium-density fiberboard; or hardboard.

2.3 CABINET HARDWARE

- A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish as selected by Architect from manufacturer's full range.
- B. Pulls: Back-mounted decorative pulls with backing plates.
- C. Hinges: Semiconcealed (wraparound) butt hinges for overlay doors.
- D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or B05091.

2.4 SOLID-SURFACE-MATERIAL COUNTERTOPS

A. Configuration: Provide countertops with the following front and backsplash style:
- 1. Front: 1-inch thick laminated bullnose, projecting 1 inch beyond face of adjacent cabinet door or drawer fronts.
- 2. Backsplash: Straight, slightly eased at corner.
- 3. Endsplash: Matching backsplash.
- B. Countertops: 1/2-inch- thick, solid surface material with front edge built up with same material.
- C. Backsplashes: 1/2-inch- thick, solid surface material.
- D. Sink: Large single bowl seamed undermount sink.
 - 1. Nominal Bowl Dimensions: 27 inches side-to-side, 17 inches front-to-back, 8 inches deep.
 - 2. Corian 881 Large Single Sink meets this specification.
- E. Fabrication: Fabricate tops in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. Install integral sink bowls in countertops in the shop.

2.5 SOLID-SURFACE-MATERIAL WINDOW STOOLS

- A. Configuration: Provide window stools with the following front style:
 - 1. Front: 1-inch thick laminated bullnose, projecting 1 inch beyond face of adjacent wall surface with bullnose ears at each end.
- B. Window Stools: 1/2-inch- thick, solid surface material with front edge built up with same material.
- C. Fabrication: Fabricate stools in one piece with shop-applied edges unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. At each end, extend stool one-half inch into drywall surface.
 - 2. At each end, return bullnose profile to wall surface.

2.6 COUNTERTOP MATERIALS

- A. Composite Wood and Agrifiber Products: Provide products that comply 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."
- B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

- C. Adhesives: Adhesives shall not contain urea formaldehyde.
- D. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Avonite Surfaces.
 - b. E. I. du Pont de Nemours and Company.
 - c. Formica Corporation.
 - d. LG Chemical, Ltd.
 - e. Wilsonart International Holdings, Inc.
 - 2. Type: Provide Standard Type unless Special Purpose Type is indicated.
 - 3. Integral Sink Bowls: Comply with ISSFA-2 and ANSI Z124.3, Type 5 or Type 6, without a precoated finish.
 - 4. Colors and Patterns: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cabinets with no variations in flushness of adjoining surfaces; use concealed shims. Where cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match cabinet face.
- B. Install cabinets without distortion so doors and drawers fit openings, are aligned, and are uniformly spaced. Complete installation of hardware and accessories as indicated.
- C. Install cabinets and countertop level and plumb to a tolerance of 1/8 inch in 8 feet.
- D. Install counters and window stools level and plumb to a tolerance of 1/8 inch in 8 feet.
- E. Fasten cabinets to adjacent units and to backing.
 - 1. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood blocking or hanging strips.
- F. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 1. Install backsplashes and endsplashes to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

2. Seal edges of cutouts in particleboard subtops by saturating with varnish.

3.2 ADJUSTING AND CLEANING

- A. Adjust cabinets and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- B. Clean casework on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 12356

SECTION 133419 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes the following for the RECC building:
 - 1. Structural-steel framing.
 - 2. Metal roof panels.
 - 3. Foamed-insulation-core metal wall panels.
 - 4. Metal soffit panels.
 - 5. Metal liner panels.
 - 6. Thermal insulation.
 - 7. Exterior doors and frames.
 - 8. Windows.
 - 9. Accessories.
 - 10. Sealants.
- B. Section includes the following for the Covered Trailer Storage building:
 - 1. Structural-steel framing.
 - 2. Metal roof panels.
 - 3. Accessories.
 - 4. Sealants.

1.3 DEFINITIONS

A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in standards referenced by this Section.

1.4 COORDINATION

- A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."
- B. Coordinate sizes and locations of roof curbs, equipment supports and roof penetrations.

C. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to metal building systems including, but not limited to, the following:
 - a. Condition of foundations and other preparatory work performed by other trades.
 - b. Structural load limitations.
 - c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
 - d. Required tests, inspections, and certifications.
 - e. Unfavorable weather and forecasted weather conditions and impact on construction schedule.
 - 2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
 - b. Structural limitations of purlins and rafters during and after roofing.
 - c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
 - d. Temporary protection requirements for metal roof panel assembly during and after installation.
 - e. Roof observation and repair after metal roof panel installation.
 - 3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
 - a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
 - b. Structural limitations of girts and columns during and after wall panel installation.
 - c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
 - d. Temporary protection requirements for metal wall panel assembly during and after installation.
 - e. Wall observation and repair after metal wall panel installation.
 - 4. Review methods and procedures related to air-vapor barrier and building insulation assemblies including, but not limited to, the following:
 - a. Compliance with requirements of the Building Code.

- b. Integrity of panel-to-panel barriers at corners, eaves, wall-to-floor and other transitions in the building envelope.
- c. Integrity of roof and wall panel opening barriers for door frames, window frames, roof curbs, and other exterior-to-interior openings and penetrations.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of metal building system component.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Metal roof panels.
 - b. Foamed-insulation-core metal panels.
 - c. Metal soffit panels.
 - d. Metal liner panels.
 - e. Thermal insulation and vapor-retarder facings.
 - f. Air-vapor barrier membranes and sealants.
 - g. Doors and frames.
 - h. Windows.
- B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and the following:
 - 1. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
 - 2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
 - a. Show provisions for attaching mezzanines, roof curbs, service walkways, platforms and pipe racks.
 - 3. Metal Roof and Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
 - a. Show roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, and items mounted on roof curbs.
 - b. Show wall-mounted items including exterior doors, vehicular doors, windows, louvers, and lighting fixtures.
 - 4. Accessory Drawings: If product data from manufacturer do not accurately describe assemblies, include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
 - a. Flashing and trim.

- b. Gutters.
- c. Downspouts.
- d. Service walkways.
- C. Samples for Initial Selection: Finish selections for units with factory-applied finishes not preselected.
- D. Samples for Verification: Finish selections for all selected and preselected finishes. Samples shall illustrate color and texture of metal products. Actual product samples with finish are not required.
- E. Samples for Verification: For the following products:
 - 1. Panels: Nominal 12 inches long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
 - 2. Flashing and Trim: Nominal 12 inches long. Include fasteners and other exposed accessories.
 - 3. Vapor-Retarder Facings: Nominal 6-inch-square Samples.
 - 4. Windows: Full-size, nominal 12-inch-long frame Samples showing typical profile.
 - 5. Glazing: Nominal 6-inch-square Samples of insulating glass units.
 - 6. Accessories: Nominal 12-inch-long Samples for each type of accessory.
- F. Door Schedule: For doors and frames. Use same designations indicated on Drawings. Include details of reinforcement.
 - 1. Door Hardware Schedule: Include details of fabrication and assembly of door hardware. Organize schedule into door hardware sets indicating complete designations of every item required for each door or opening.
 - 2. Keying Schedule: Not work of this Section. Construction keying by General Contractor. Final keying by Owner.
- G. Delegated-Design Submittal: For metal building systems.
 - 1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer responsible for their preparation.
- H. INFORMATIONAL SUBMITTALS
- I. Qualification Data: For erector, manufacturer and professional engineer.
- J. Welding certificates.
- K. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
 - 1. Name and location of Project.
 - 2. Order number.
 - 3. Name of manufacturer.
 - 4. Name of Contractor.
 - 5. Building dimensions including width, length, height, and roof slope.

- 6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
- 7. Governing building code and year of edition.
- 8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
- 9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
- 10. Building-Use Category: Indicate category of building use and its effect on load importance factors.
- L. Erector Certificates: For qualified erector, from manufacturer.
- M. Material Test Reports: For each of the following products:
 - 1. Structural steel including chemical and physical properties.
 - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shop primers.
 - 5. Nonshrink grout.
- N. Source quality-control reports.
- O. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panel finishes and door hardware to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer.
 - 1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
 - 2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.
- B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code Steel."
 - 2. AWS D1.3, "Structural Welding Code Sheet Steel."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect foam-plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
 - 3. Complete installation and concealment of foam-plastic materials as rapidly as possible in each area of construction.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

1.11 WARRANTY

- A. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 25 years from date of Substantial Completion.
- B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide VP Buildings; a United Dominion company or comparable product by one of the following:
 - 1. Butler Manufacturing Company.
 - 2. Nucor Building Systems.
 - 3. Star Building Systems.

2.2 SYSTEM DESCRIPTION – RECC BUILDING

- A. Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.
- B. Primary-Frame Type:
 - 1. Rigid Modular: Solid-member, structural-framing system with interior columns.
- C. End-Wall Framing (East End): Manufacturer's standard, for buildings not required to be expandable, consisting of load-bearing end-wall and corner columns and rafters.
 - 1. Engineer framing to accommodate adjacent mezzanine, curtain wall system and entrance canopy framing.
- D. End-Wall Framing (West End): Engineer end walls to be expandable. Provide primary frame, capable of supporting full-bay design loads, and end-wall columns.
- E. Secondary-Frame Type: Manufacturer's standard purlins and joists and partially insetframed and /or exterior-framed (bypass) girts.
- F. Eave Height: Manufacturer's standard height, as indicated by nominal height on Drawings.
- G. Bay Spacing: As indicated on Drawings.
 - 1. End bay spacing shall accommodate existing slab dimensions.
- H. Roof Slope: As indicated on Drawings.
- I. Roof System: Manufacturer's standard standing-seam, trapezoidal-rib, metal roof panels.
- J. Exterior Wall System: Manufacturer's standard foamed-insulation-core metal wall panels.

2.3 SYSTEM DESCRIPTION – COVERED TRAILER STORAGE BUILDING

- A. Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.
- B. Primary-Frame Type:
 - 1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.
- C. End-Wall Framing: Engineer end walls to be expandable. Provide primary frame, capable of supporting full-bay design loads, and end-wall columns.
- D. Secondary-Frame Type: Manufacturer's standard purlins and joists.
- E. Eave Height: Manufacturer's standard height, as indicated by nominal height on Drawings.
- F. Bay Spacing: As indicated on Drawings.
- G. Roof Slope: As indicated on Drawings.
- H. Roof System: Manufacturer's standard standing-seam, trapezoidal-rib, metal roof panels.

2.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal building system.
 - 1. Engineer shall confirm the design requirements of the building code and referenced standards cited here but shall not lessen minimum quantities or raise maximum quantities indicated herein without approval by the Architect.
- B. Occupancy Category: This building is assigned to Occupancy Category IV as defined in ASCE 7, Table 1.1 and Massachusetts State Building Code 8th Edition, Table 1604.5 as an essential facility "for designated emergency preparedness, communications and operations centers and other facilities required for emergency response."
- C. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
 - 1. Design Loads: As required by the Massachusetts State Building Code 8th Edition, Section 1603, and as follows:
 - a. Mezzanine Live Load: 150 lbs per sq. ft.
 - b. Equipment Loads on Roof: As indicated on Drawings.
 - c. Collateral Loading: 5 lbs. per sq. ft. for interior fire protection, mechanical and electrical systems.

- 2. Deflection and Drift Limits: No greater than the following:
 - a. Purlins and Rafters: Vertical deflection of 1/240 of the span.
 - b. Girts: Horizontal deflection of 1/240 of the span.
 - c. Metal Roof Panels: Vertical deflection of 1/240 of the span.
 - d. Metal Wall Panels: Horizontal deflection of 1/240 of the span.
 - e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
 - f. Lateral Drift: Maximum of 1/400 of the building height.
- D. Seismic Performance: Metal building system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the Massachusetts Building Code 8th Edition.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- F. Fire-Resistance Ratings: Where assemblies are indicated to have a fire-resistance rating, provide metal panel assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 or ASTM E 108 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory," FM Global's "Approval Guide," or from the listings of another qualified testing agency.
- G. Fire Propagation Characteristics: Exterior wall assemblies containing foam plastics pass NFPA 285 fire test.
- H. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As required by the Massachusetts State Building Code 8th Edition.
- I. Air Infiltration for Metal Roof Panels: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- J. Air Infiltration for Metal Wall Panels: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- K. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:

- 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- L. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft.
- M. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: UL 90.
- N. Thermal Performance for Opaque Elements: Provide the following maximum U-factors and minimum R-values when tested according to ASTM C 1363 or ASTM C 518. The values indicated here are obtained from ANSI/ASHRAE/IES Standard 90.1-2010 (2013 addenda) for Massachusetts (Climate Zone 5).
 - 1. Metal Roof Panel Assemblies:
 - a. U-Factor of Assembly: 0.037 BTU/h-sf-°F.
 - b. R-Value of Insulation: R-11 liner system, R-19 batt insulation, R-3.5 thermal spacer blocks.
 - 2. Metal Wall Panel Assemblies:
 - a. U-Factor of Assembly: 0.050 BTU/h-sf-°F.
 - b. R-Value of Insulation: R-19 continuous insulation.

2.5 STRUCTURAL-STEEL FRAMING

- A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."
- B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.
- D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; wind bracing and elevated floor framing.
 - 1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
 - 2. Rigid Modular Frames: I-shaped frame sections fabricated from shop-welded, builtup steel plates or structural-steel shapes. Interior columns are permitted, fabricated from round steel pipes or tubes, or shop-welded, built-up steel plates.
 - 3. Frame Configuration: Varies.
 - 4. Exterior Column: Uniform depth to minimum height indicated.

- 5. Rafter: Uniform depth or tapered.
- E. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for fieldbolted assembly to comply with the following:
 - 1. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.
 - 2. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.
 - a. Typical end wall columns and girts shall align for a flush installation.
 - b. Coordinate bearing elevation of corner and end wall columns with existing and new top-of-slab elevations. Conditions vary.
 - 3. Exposed Columns: Utilize I-shaped sections at southeast corner of building where structure is exposed to support canopy construction.
 - a. Exposed primary frame corner end wall and side wall columns shall be continuous, straight sections where visible.
 - b. Exposed end wall and side wall columns shall align with end wall and side wall secondary framing.
 - c. Exposed column and base plate fabrications including leveling plates and fasteners shall be G90 hot-dip galvanized after fabrication.
- F. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:
 - 1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch-wide flanges.
 - a. Depth: As needed to comply with system performance requirements.
 - 2. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch-wide flanges.
 - a. Depth: As required to comply with system performance requirements.
 - 3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
 - 4. Flange Bracing: Minimum 2-by-2-by-1/8-inch structural-steel angles or 1-inchdiameter, cold-formed structural tubing to stiffen primary-frame flanges.
 - 5. Sag Bracing: Minimum 1-by-1-by-1/8-inch structural-steel angles.
 - 6. Base or Sill Angles: Manufacturer's standard base angle, minimum 3-by-2-inch, fabricated from zinc-coated (galvanized) steel sheet.
 - 7. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.

- 8. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
- 9. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.
- G. Elevated Floor Framing: Manufacturer's standard structural-framing system, designed to withstand required loads; fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide columns, beams, joists and bracing, factory drilled for field-bolted assembly.
 - 1. Provide permanent steel forms and pour stops mechanically fastened or field-welded in place for cast-in-place concrete floor.
- H. Bracing: The diaphragm action of metal panels shall NOT be utilized in the design to resist wind forces. Provide adjustable wind bracing using any of the following methods:
 - 1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50; or ASTM A 529/A 529M, Grade 50; minimum 1/2-inch-diameter steel; threaded full length or threaded a minimum of 6 inches at each end.
 - 2. Cable: ASTM A 475, minimum 1/4-inch-diameter, extra-high-strength grade, Class B, zinc-coated, seven-strand steel; with threaded end anchors.
 - 3. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.
 - 4. Fixed-Base Columns: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
 - 5. Rigid Portal Frames: Fabricated from shop-welded, built-up steel plates or structuralsteel shapes to match primary framing; of size required to withstand design loads.
 - a. The Covered Trailer Storage building shall employ portal frames to keep bays open for vehicle access.
- I. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.
- J. Materials:
 - 1. W-Shapes: ASTM A 992/A 992M.
 - 2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
 - 3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
 - 4. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing, for interior columns and exposed end-wall rafters and columns.
 - Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55, or High-Strength Low-Alloy Steel (HSLAS) or High-Strength Low-Alloy Steel with Improved Formability (HSLAS-F), Grades 45 through 70; or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80, or HSLAS, Grades 45 through 70.

- 6. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, SS, Grades 33 through 80, or HSLAS or HSLAS-F, Grades 50 through 80; with G90 coating designation; mill phosphatized.
- 7. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, SS, Grades 33 through 80, or HSLAS or HSLAS-F, Grades 50 through 80; with G90 coating designation.
 - b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, SS, Grade 50 or 80; with Class AZ50 coating.
- 8. Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 31, with section properties determined by the delegated design, and as follows:
 - a. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through Grade 80, G90 zinc coating.
 - b. Profile Depth: Minimum ¹/₂-inch.
 - c. Design Uncoated-Steel Thickness: Minimum 0.0295 inch (22 gage.
 - d. Span Condition: Determined by delegated design.
 - e. Side Laps: Overlapped or interlocking seam at Contractor's option.
 - f. Pour Stops: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
 - g. Provide form deck accessories including closure strips, mechanical fasteners, weld washers, and galvanizing repair paint.
 - h. Varco-Pruden Deck-Liner panel is an acceptable product. Temporary shoring may be required by the delegated design.
- 9. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A, carbon-steel, hex-head bolts; ASTM A 563 carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.
- 10. Structural Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
- 11. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts; ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers, plain.
- 12. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex-head steel structural bolts with spline ends.
- 13. Headed and Unheaded Anchor Rods: ASTM F 1554, Grade 36.
 - a. Configuration: Straight.
 - b. Nuts: ASTM A 563 heavy-hex carbon steel.
 - c. Plate Washers: ASTM A 36/A 36M carbon steel.
 - d. Washers: ASTM F 436 hardened carbon steel.
- 14. Threaded Rods: ASTM A 572/A 572M, Grade 50.

- a. Nuts: ASTM A 563 heavy-hex carbon steel.
- b. Washers: ASTM F 436 hardened carbon steel.
- 15. Finish for Rods, Bolts, Nuts and Washers: Hot-dip zinc coating, ASTM F 2329, Class C, or mechanically deposited zinc coating, ASTM B 695, Class 50
 - a. Provide hot-dip zinc coating for all items embedded in concrete.
- K. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.
 - 1. Clean and prepare in accordance with SSPC-SP2.
 - 2. Coat with manufacturer's standard primer. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil.
 - a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.

2.6 METAL ROOF PANELS

- A. Standing-Seam, Trapezoidal-Rib, Metal Roof Panels [Drawing Designation MP-1]: Formed with raised trapezoidal ribs at panel edges and flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
 - 1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024inch nominal uncoated steel thickness (24 gage). Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Exterior Finish: Fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
 - 2. Clips: Slotted to accommodate thermal movement.
 - 3. Joint Type: Mechanically seamed.
 - 4. Panel Coverage: 24 inches.
 - 5. Panel Height: 3 inches.
 - 6. Uplift Rating: UL 90.
 - 7. Basis-of-Design Product: Varco-Pruden HWR (High Wind Roof) System.

2.7 FOAMED-INSULATION-CORE METAL WALL PANELS

- A. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels [Drawing Designation MP-2, MP-3]: Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.
 - 1. Panel Thermal-Resistance Value (minimum R-Value including air films): 22.27 @ 75 deg. mean temp. (ASTM C-518).

- 2. Facing Material [MP-2]: Fabricate panel with exterior and interior facings of same material. Zinc-coated (galvanized) steel sheet, G-90. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Exterior Facing: 0.024-inch (24 gage) nominal uncoated steel thickness, stucco textured.
 - b. Interior Facing: 0.018-inch (26 gage) nominal uncoated steel thickness, shallow ribs (1/16-inch nominal planked design).
 - c. Exterior Finish: Ceramic pigmentation with polyvinylidene fluoride, Varco Pruden Tuff-Cote finish system.
 - d. Interior Finish: Siliconized polyester.
 - e. Color: As selected by Architect from manufacturer's full range.
 - f. Basis-of-Design Product: Varco-Pruden ThermalClad Tuff-Wall Insulated Panel System.
- 3. Facing Material [MP-3]: Fabricate panel with exterior and interior facings of same material. Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Exterior Facing: 0.018-inch (26 gage) nominal uncoated steel thickness, embossed in a vertical ribbed pattern.
 - b. Interior Facing: 0.018-inch (26 gage) nominal uncoated steel thickness, shallow ribs (1/8-inch nominal planked design).
 - c. Exterior Finish: Fluoropolymer.
 - d. Interior Finish: Siliconized polyester.
 - e. Color: As selected by Architect from manufacturer's full range.
 - f. Basis-of-Design Product: Varco-Pruden ThermalClad Reveal Insulated Panel System.
- 4. Panel Coverage: 42 inches nominal.
- 5. Panel Thickness: 3 inches.
- 6. Insulation Core: Polyurethane foam using a non-CFC blowing agent, foamed-inplace, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.
 - a. Closed-Cell Content: 90 percent when tested according to ASTM D 6226.
 - b. Density: 2.0 to 2.6 lb/cu. ft. when tested according to ASTM D 1622.
 - c. Compressive Strength: Minimum 20 psi when tested according to ASTM D 1621.
 - d. Shear Strength: 26 psi when tested according to ASTM C 273/C 273M.
- 7. Fire-Test-Response Characteristics: Class A according to ASTM E 108.
- 8. Surface-Burning Characteristics: Flame-spread index of 25 or less and a smokedeveloped index of 450 or less, per ASTM E 84.

2.8 METAL SOFFIT PANELS

A. General: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to

supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.

- B. Concealed-Fastener, Flush-Profile, Metal Soffit Panels [Drawing Designation MP-4]: Formed with vertical panel edges and flush surface with two equally spaced stiffening beads; with flush joint between panels; with 1-inch-wide flange for attaching interior finish; designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factoryapplied sealant in side laps.
 - 1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024inch (24 gage nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Exterior Finish: Fluoropolymer.
 - b. Color: As selected by Architect from manufacturer's full range.
 - 2. Panel Coverage: 12 inches.
 - 3. Panel Height: 7/8-inch.
 - 4. Basis-of-Design Product: Varco-Pruden ThermalClad FP-12 Soffit Panel System.

2.9 METAL LINER PANELS

- A. Exposed-Fastener, Tapered-Rib, Metal Liner Panels [Drawing Designation MP-5]: Formed with trapezoidal corrugations; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.
 - 1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.030inch nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Interior Finish: Siliconized polyester.
 - b. Color: As selected by Architect from manufacturer's full range.
 - 2. Rib Spacing: 3 inches o.c.
 - 3. Panel Coverage: 36 inches.
 - 4. Panel Height: 0.5 inches.
 - 5. Basis-of-Design Product: Varco-Pruden Deck-Liner Panel.

2.10 PANEL FINISHES

- A. Exposed Coil-Coated Finish:
 - 1. Fluoropolymer: AAMA 621. Three-coat fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

- 2. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a minimum dry film thickness of 0.2 mil for primer and 0.8 mil for topcoat.
- B. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mils.

2.11 THERMAL INSULATION

- A. Thermal insulation is not required for Covered Trailer Storage building.
- B. Basis-of-Design Product: Bay Insulation Systems, Filled Cavity Long Tab Banded Insulation System.
 - 1. System shall be provided complete, from one source and includes banding, fabric facing, insulation, fasteners and adhesives.
 - 2. The installed roof insulation system shall provide a continuous air/vapor barrier as part of the overall building air/vapor barrier.
 - 3. Other acceptable manufacturers and products include:
 - a. Guardian Building Products, Banding System.
- C. Basis-of-Design Product System Description:
 - 1. Banding to Support Insulation: Installed perpendicular to purlins on 30-inch centers; attached to the bottom of eave strut and purlin flanges.
 - 2. Lower Layer of Insulation: NAIMA 202-96 certified; nominal R-19 faced fiberglass insulation layer installed parallel to purlins to fill purlin cavity with continuous extended edges of facing (long tabs) secured over top flanges of purlins, overlapped and sealed to long tabs from adjacent purlin cavities to create a continuous air/vapor barrier.
 - 3. Upper Layer of Insulation: NAIMA 202-96 certified; nominal R-11 fiberglass insulation layer installed perpendicular to purlins shall cover lower layer and overlay purlins.
 - 4. 1-inch x 3-inch extruded polystyrene thermal spacer blocks applied above the insulation to the top of the purlins.
 - 5. Exposed surfaces shall exhibit Class A surface burning characteristics (Flame Spread Index: 0-25; Smoke Developed Index: 0-450).
 - 6. Thermal Transmittance of System with Roof Panel: $U = 0.037 \text{ Btu/hr/ft}^2/\text{degF}$.
- D. Basis-of-Design Product Component Materials:
 - 1. Vapor-Retarder Facing: ASTM C 1136, Type II, IV, with permeance not greater than 0.02 perm when tested according to ASTM E 96, Procedure A. The following manufacturer's published property values are presented as guides and do not represent required minimum or maximum values:
 - a. Composition: White polypropylene film facing, flame resistant adhesive, tridirectional fiberglass scrim reinforcing, metalized polyester film backing.

- b. Weight: $14 \text{ lbs}/1000 \text{ ft}^2$.
- c. Bursting Strength: 100 psi (ASTM D774).
- d. Tensile Strength: 35 lbs/inch width (MD), 35 lbs/inch width (XD) (ASTM C1136).
- e. Thickness: Nominal 0.007 inch
- f. Accelerated Aging: No corrosion, no delamination, after 30 days exposure @ 95% RH, 120°F.
- g. Thermal stability: -40°F, remains flexible, no delamination; 4 hours @ 240°F, remains flexible, no delamination (ASTM D1790).
- h. Water Immersion: 24 hours @ 73°F., no delamination.
- i. Mold Resistance: No growth (ASTM C665/C1338).
- j. Dimensional Stability: 0.25% (ASTM D1204).
- k. Light Reflectance: LRV = 85 percent (ASTM C523).
- 1. Surface Burning Characteristics (Facing/Backing): Flame Spread Index: 10/10; Smoke Developed Index: 35/40 (ASTM E 84/UL 723).
- m. Fabric Warranty: Limited 10-year material warranty.
- 2. Banding: For supporting insulation between purlins, 0.022-inch minimum thickness, 1-inch wide, continuous length, formed steel banding, white color to match insulation facing, attached with ³/₄-inch TEK screws to the bottom of eave strut and purlin flanges.
- 3. Faced Metal Building Insulation: ASTM C 991, Type II, glass-fiber-blanket insulation; 0.5-lb/cu. ft. density; extended width, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.
- 4. Unfaced Metal Building Insulation: ASTM C 991, Type I (blankets without membrane covering), glass-fiber-blanket insulation:
 - a. Meets standard NAIMA 202-96 (R) (Rev 2000) certified flexible fiberglass insulation for use in metal buildings.
 - b. Flame-spread index of 25 or less.
 - c. Passes ASTM E 136 for combustion characteristics: non-combustible.
- 5. Fasteners: TEK screws.
- 6. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vaporretarder manufacturer for sealing joints and penetrations in vapor retarder.
- E. Submit the following:
 - 1. Installation Manual.
 - 2. Certification Sheets.
 - 3. Fabric Shop Drawings.
 - 4. Product Warranty.
- F. Reference Standards:
 - 1. ASTM C991 Standard for flexible fibrous glass insulation for metal buildings.
 - 2. ASTM C 1136 Standard specification for flexible, low permeance vapor retarders for thermal insulation.
 - 3. ASTM E 84 Standard for surface burning characteristics of building materials.
 - 4. ASTM E 96 Standard test method for water vapor transmission of materials in sheet form.

- 5. NAIMA 202-96(R) (Rev 2000) Standard for flexible fiberglass insulation for use in metal buildings.
- 6. NFPA 255 Standard method of test for surface burning characteristics of building materials.
- 7. UL 723 Test for surface burning characteristics of building materials.

2.12 FALL PROTECTION SYSTEM

- A. Provide fall protection systems to comply with OSHA regulations including, but not limited to, the following.
 - 1. OSHA 1926.501 Duty to have fall protection.
 - 2. OSHA 1926.502 Fall protection systems criteria and practices.
 - 3. OSHA 1926.754 (e) (3) Covering roof and floor openings.
- B. System installation shall meet OSHA leading-edge fall protection standard 29 CFR-1926.501 (b) (1).
 - 1. Fall protection shall be accomplished with permanently installed components of the insulation system, with fall protection netting, and by the means and methods of the roof and insulation installation.

2.13 EXTERIOR DOORS AND FRAMES

- A. Exterior Doors and Frames: Metal building system manufacturer's standard pre-assembled doors and frames; SDI compliant; prepared and reinforced at strike and at hinges to receive factory- and field-applied hardware according to BHMA A156 Series.
 - 1. Basis-of-Design Product: Bay Industries, Inc., Expi-Door Systems, Series 700 PA pre-assembled door and frame units.
 - 2. Fabricate doors and frames in accordance with ANSI/SDI A250.8-2014 for Level 3 and Physical Performance Level A classification.
 - 3. Steel Doors: 1-3/4 inches thick; fabricated from metallic-coated steel face sheets, 0.053-inch nominal uncoated steel thickness, of seamless, hollow-metal construction; with 0.042-inch nominal uncoated steel thickness, flush metallic-coated steel channels welded to face sheets at top and bottom of door.
 - a. Design: As indicated on Drawings.
 - b. Core: Polyurethane foam with U-factor rating of at least 0.07 Btu/sq. ft. x h x deg F.
 - c. Glazing Frames: Steel frames to receive field-installed glass.
 - d. Glazing: Tempered insulating glass units.
 - 4. Steel Frames: Fabricate 2-inch-wide face frames from zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.053-inch nominal uncoated steel thickness.
 - a. Type: Face welded.

- 5. Fabricate concealed stiffeners, reinforcement, edge channels, and moldings from either cold- or hot-rolled steel sheet.
- 6. Hardware: Provide ANSI/BHMA A156 Grade 1 hardware as follows:
 - a. Provide ADA compliant hardware for each door leaf, as follows:
 - 1) Hinges: BHMA A156.1. Stainless steel ball bearing, heavy duty, full mortise, template type hinges; 4-1/2 by 4-1/2 inches, with non-removable stainless steel pin.
 - a) Provide 3 hinges for doors 7 feet and less in height
 - b) Provide 4 hinges for doors greater than 7 feet in height.
 - 2) Hinges (Contractor's Option): BHMA A156.26. Continuous, gear-type extruded-aluminum, heavy duty, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
 - a) Length of hinge shall match height of door. Width of hinge leaves shall match thickness of door.
 - 3) Lockset: BHMA A156.2. Mortise, with lever handle type.
 - 4) Strikes: ANSI. Wrought stainless steel with wrought strike box, typical.
 - 5) Electric Strikes: Where indicated, for wiring to building security system. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 6) Threshold: BHMA A156.21. Extruded aluminum, mill finish, ¹/₂-inch high.
 - 7) Closer: BHMA A156.4. Surface-applied, heavy-duty hydraulic type, hold-open feature, aluminum or stainless steel cover, parallel arm installation.
 - 8) Weather Stripping: Vinyl applied to head and jambs, with drip cap and vinyl sweep at sill.
 - 9) Interior Kick Plate: Stainless steel, 12 inches high x door width.
 - 10) Stop: Heavy duty door stop with replaceable bumper; Rockwood #463.
 - b. Provide each pair of double doors with the following hardware in addition to that specified for each leaf.
 - 1) Mullion: Removable with stainless steel latch strikes (not electric), weather stripping, secured with interior cylinder lock.
 - c. Finishes shall be 622 Powder Coated Black (brass/bronze base), 693 Satin Stainless (stainless steel base), and 693 Black Painted (aluminum, steel).
- 7. Anchors and Accessories: Manufacturer's standard units, galvanized according to ASTM A 123/A 123M. Provide subframes sized to girt depth, girt and base clip anchors, masonry wall anchors and fasteners.
- 8. Fabrication: Fabricate doors and frames to be rigid; neat in appearance; and free from defects, warp, or buckle. Provide continuous welds on exposed joints; grind, dress, and make welds smooth, flush, and invisible.

B. Materials:

- 1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
- 2. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, CS, Type B; free of scale, pitting, or surface defects; pickled and oiled.
- 3. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, CS, Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation.
- C. Finishes for Exterior Doors and Frames:
 - 1. Factory-Applied Paint Finish: Manufacturer's standard, complying with SDI A250.3 for performance and acceptance criteria.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.14 WINDOWS

- A. Aluminum Windows: For flush installation in foamed-insulation-core metal wall panels.
 - 1. Basis-of-Design Product: WinTech Series 250 Thermal Projected Windows installed utilizing the Wintech Insulview installation fin system.
 - 2. Type, Performance Class, and Performance Grade: CW-PG60-AP in compliance with AAMA/WDMA/CSA 101/I.S.2/A440-08 and as follows:
 - a. Air Infiltration Test: Test unit in accordance with ASTM E 283 at a static air pressure difference of 1.6 psf. Air infiltration shall not exceed .03 cfm per square foot.
 - b. Water Resistance Test: Test unit in accordance with ASTM E 331/ASTM E 547 at a static air pressure difference of 15.00 psf. There shall be no uncontrolled water leakage.
 - c. Uniform Load Deflection Test: Test unit in accordance with ASTM E 330 at a static air pressure difference of 60 psf positive and negative pressure. No member shall deflect over L/175 of its span.
 - d. Uniform Load Structural Test: Test unit in accordance with ASTM E 330 at a static air pressure difference of 90 psf, both positive and negative. At conclusion of test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms, nor any other damage that would cause the window to be inoperable.
 - e. Forced Entry Resistance: Windows shall be tested in accordance to ASTM F 588 or AAMA 1302.5 and meet the requirements of performance level 10.
 - f. Condensation Resistance Test (CRF): Test unit in accordance with AAMA 1503.1. Condensation Resistance Factor (CRF) shall not be less than 55 (frame) and 62 (glass ¼-inch, VE 1-2M, ¼-inch CLR)..
 - g. Thermal Transmittance Test (Conductive U-Value): Test unit in accordance with AAMA 1503.1. Conductive thermal transmittance (U-Value) shall not be more than 0.56 BTU/hr/ft²/°F.

- 3. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 0.062-inch thickness at any location for main frame and sash members.
 - a. Extruded aluminum shall be 6063-T5 or T6 alloy and tempered.
- 4. Thermally Improved Construction: Fabricate window units with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
 - a. All exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier. For purposes of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.
 - b. The thermal barrier shall be a poured and debridged thermal barrier made of two-part polyurethane.
 - c. At least the window frame sill extrusion shall have a mechanically staked system consisting of alternating aluminum cleats no more than one inch on center along the thermal barrier pocket. This is intended to minimize the effects of thermal barrier dry shrinkage.
- 5. Weather-Strip: All primary weather-strip shall be Dual Durometer Vinyl Bulb or equal.
- 6. Fasteners, Anchors, and Clips: Nonmagnetic stainless steel, aluminum, or other noncorrosive material, compatible with aluminum window members, trim, hardware, anchors, and other components of window units. Fasteners shall not be exposed, except for attaching hardware.
 - a. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.128 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, spline grommet nuts.
- 7. Hardware: Manufacturer's standard; of aluminum, stainless steel, die-cast steel, malleable iron, or bronze; including the following:
 - a. Latching cam handles on bottom rail of out-swinging vent sash with corresponding strikes on frame.
 - b. Stainless steel operating arms.
- B. Glazing:
 - 1. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear), thickness as indicated.
 - 2. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201.
 - a. Provide safety glazing as required by authorities having jurisdiction.
 - b. Provide safety glazing labeling.

- 3. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of 2.5-mmthick clear float glass or safety glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - a. Units shall be manufactured by the window manufacturer.
 - b. Units shall be 1 inch thick.
 - c. Provide low-e coating on surface 2.
 - d. Glass spacer to be the Duraseal high performance flexible spacer system as manufactured by Truseal Corp or equal.
- C. Fabrication: Provide factory glazed, thermally broken window units with additional extrusions, receptors or subframe assemblies that create a continuous air/vapor barrier when installed in openings in the foamed-insulation-core metal wall panels of the building.
 - 1. Frames:
 - a. All aluminum frame and vent extrusions shall have a minimum wall thickness of 0.062 inch.
 - b. Thermal barriers shall align at all frame, frame extension and vent corners.
 - c. Mechanical fasteners and hardware items shall not bridge thermal barriers.
 - d. Depth of frame and vent shall not be less than $2\frac{1}{2}$ inch.
 - e. Frame components shall be mechanically fastened. All window frame and meeting rail horizontal to vertical corners shall be sealed with closed cell polyethylene gaskets to prevent water migration.
 - 2. Frame Extensions: Thermally improved aluminum window frame extensions that fit the wall panel thickness and provide attachment for the window unit.
 - a. Provide Wintech Insulview installation fin system.
 - 3. Sash:
 - a. All sash extrusions shall have a minimum wall thickness of .062.
 - b. Sash vertical members shall telescope into the sash horizontals and be mechanically fastened.
 - c. The sash shall be single or double weather-stripped.
 - 4. Glazing: Glaze window units in the factory using manufacturer's standard sealant process.
 - a. All units shall be glazed with a pumpable silicone backbed with .030-inch glass spacer beads. Glass shall be held in place by a removable, extruded aluminum, glazing bead. Vinyl glazing beads are not permitted. The aluminum glazing bead shall be isolated from the glass by a pull-in glazing vinyl.
 - 5. Mullions: Between adjacent window units, thermally improved, fabricated of extruded aluminum matching finish of window units.
 - 6. Insect Screens: Provide removable insect screen on each operable exterior sash, as follows:

- a. Frame: Manufacturer's standard extruded aluminum framing, finished to match window unit.
- b. Fabric: Manufacturer's standard aluminum wire fabric or glass-fiber mesh fabric, dark gray color.
- c. Screen shall have sliding wickets or operate to allow access to window latching device without removing the screen.
- D. Finish: Finish all exposed areas of aluminum windows and components with high performance 70% PVDF fluoropolymer resin based paint system as follows:
 - 1. AA Description/Guide Specification: AA-M12-C42-R1X/2605-98.
 - 2. Color: As selected by Architect from manufacturer's full range.
- E. Total Window System Warranty:
 - 1. The responsible contractor shall assume full responsibility and warrant for one (1) year the satisfactory performance of the total window installation which includes that of the windows, hardware, glass (including insulated units), glazing, anchorage and setting system, sealing, flashing, etc., as it relates to air, water, and structural adequacy as called for in the specifications and approved shop drawings.
 - 2. The responsible contractor shall warrant for five (5) years the seal integrity of the insulating glass.
 - 3. Any deficiencies during the warranty period due to such elements not meeting the specifications shall be corrected per the provisions of the warranty by the responsible contractor at his expense.

2.15 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
 - 1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
 - 2. Clips: Manufacturer's standard, formed from steel or stainless-steel sheet, designed to withstand negative-load requirements.
 - 3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from steel or stainless-steel sheet or nylon-coated aluminum sheet.
 - 4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

- 5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefinfoam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- 6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch standoff; fabricated from extruded polystyrene.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
 - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefinfoam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- D. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match adjacent metal panels.
 - 1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
 - 2. Opening Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.030-inch nominal uncoated steel thickness, prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
- E. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch-long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
 - 1. Gutter Supports: Fabricated from same material and finish as gutters.
 - 2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
- F. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018inch nominal uncoated steel thickness, prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot-long sections, complete with formed elbows and offsets.
 - 1. Mounting Straps: Fabricated from same material and finish as gutters.
- G. Service Walkways: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.048-inch nominal uncoated steel thickness, steel plank grating; with slip-resistant pattern;

36-inch overall width. Support walkways on framing system anchored to metal roof panels without penetrating panels; with predrilled holes and clamps or hooks for anchoring.

- H. Roof Curbs: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.048-inch nominal uncoated steel thickness prepainted with coil coating; finished to match metal roof panels; with welded top box and bottom skirt, and integral full-length cricket; capable of withstanding loads of size and height indicated.
 - 1. Curb Subframing: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.060-inch nominal uncoated steel thickness, angle-, C-, or Z-shaped metallic-coated steel sheet.
 - 2. Insulation: 1-inch-thick, rigid type.
- I. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.
- J. Materials:
 - 1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
 - a. Fasteners for Metal Roof Panels: Self-drilling, Type 410 stainless steel or selftapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM washer under heads of fasteners bearing on weather side of metal panels.
 - b. Fasteners for Metal Wall Panels: Self-drilling, Type 410 stainless steel or selftapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head.
 - c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 - d. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
 - 2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
 - 3. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
 - 4. Metal Panel Sealants:
 - a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylenecompound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
 - b. Joint Sealant: ASTM C 920; one part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

2.16 FABRICATION

- A. General: Design components and field connections required for erection to permit easy assembly.
 - 1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
 - 2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.
- B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.
- C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
 - 1. Make shop connections by welding or by using high-strength bolts.
 - 2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
 - 3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
 - 4. Weld clips to frames for attaching secondary framing if applicable, or punch for bolts.
 - 5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.
- D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
 - 1. Make shop connections by welding or by using non-high-strength bolts.
 - 2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.
- E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
 - 1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

2.17 SOURCE QUALITY CONTROL

A. Fabrication shall be performed by manufacturer registered and approved by authorities having jurisdiction to perform such Work without special inspection.

1. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed according to Contract requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
 - 1. Engage land surveyor to perform surveying.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

- A. Erect metal building system according to manufacturer's written instructions and drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

- 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.
- F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.
 - 1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.
 - a. Joint Type: Snug tightened or pretensioned as required by manufacturer.
- G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.
 - 1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
 - 2. Locate and space wall girts to suit openings such as doors and windows.
 - 3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.
- H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
 - 1. Tighten rod and cable bracing to avoid sag.
 - 2. Locate interior end-bay bracing only where indicated.
- I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.
- J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
 - 1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.
- D. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
 - a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.
 - 2. Install metal panels perpendicular to structural supports unless otherwise indicated.
 - 3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 5. Locate metal panel splices over structural supports with end laps in alignment.
 - 6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- E. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.
 - 1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
- F. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.

- 1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
- 2. Prepare joints and apply sealants to comply with approved submittals.

3.5 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
 - 1. Install ridge caps as metal roof panel work proceeds.
 - 2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.
 - 1. Install clips to supports with self-drilling or self-tapping fasteners.
 - 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
 - 3. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
 - 4. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Predrill panels for fasteners.
 - 5. Provide metal closures at peaks, rake edges, rake walls, and each side of ridge caps.
- C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.
- D. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet on slope and location lines and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
 - 2. Shim or otherwise plumb substrates receiving metal wall panels.
 - 3. When two rows of metal panels are required, lap panels 4 inches minimum.
 - 4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.

- 5. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Predrill panels.
- 6. Flash and seal metal wall panels with weather closures at eaves and rakes, and at perimeter of all openings. Fasten with self-tapping screws.
- 7. Install screw fasteners in predrilled holes.
- 8. Install flashing and trim as metal wall panel work proceeds.
- 9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated on Drawings; if not indicated, as necessary for waterproofing.
- 10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
- 11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.
- C. Insulated Metal Wall Panels: Install insulated metal wall panels on exterior side of girts. Attach panels to supports at each panel joint using concealed clip and fasteners at maximum 42 inches o.c., spaced not more than manufacturer's recommendation. Fully engage tongue and groove of adjacent insulated metal wall panels.
 - 1. Install clips to supports with self-tapping fasteners.
 - 2. Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels as weather seal.
- D. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet, noncumulative; level, plumb, and on location lines; and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 METAL SOFFIT PANEL INSTALLATION

- A. Provide metal soffit panels the full width of soffits. Install panels perpendicular to support framing.
- B. Flash and seal metal soffit panels with weather closures where panels meet walls and at perimeter of all openings.

3.8 THERMAL INSULATION INSTALLATION

- A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.
- B. For insulations with factory-installed facings:
 - 1. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
 - 2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.

- 3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor retarder.
- C. For insulations with field-installed facings:
 - 1. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation, with both sets of facing tabs sealed, to provide a complete vapor retarder.
- D. Blanket Roof Insulation: Comply with the following installation method:
 - 1. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.
 - a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.
 - 2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.9 DOOR AND FRAME INSTALLATION

- A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place according to manufacturers' written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.
- B. Exterior Doors and Frames: Install doors and frames according to NAAMM-HMMA 840. Fit non-fire-rated doors accurately in their respective frames, with the following clearances:
 - 1. Between Doors and Frames at Jambs and Head: 1/8 inch.
 - 2. Between Edges of Pairs of Doors: 1/8 inch.
 - 3. At Door Sills with Threshold: 3/8 inch.
 - 4. At Door Sills without Threshold: 3/4 inch.
- C. Door Hardware:
 - 1. Install surface-mounted items after finishes have been completed at heights indicated in DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 3. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
 - 4. Set thresholds for exterior doors in full bed of sealant complying with requirements for concealed mastics.
3.10 WINDOW INSTALLATION

- A. General: Install windows plumb, rigid, properly aligned, without warp or rack of frames or sash, and securely fasten in place according to manufacturer's written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each window frame with elastomeric sealant used for metal wall panels.
 - 1. Separate dissimilar materials from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in AAMA/WDMA/CSA 101/I.S.2/A440.
- B. Set sill members in bed of sealant or with gaskets, for weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Install screens.

3.11 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 - 3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

- C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
 - 1. Tie downspouts to underground drainage system indicated.
- E. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.
- F. Service Walkways: Install walkways at locations indicated on Drawings. Fasten to secondary structure in conjunction with roof panel installation and seal as recommended by manufacturer.
- G. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.12 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.
- B. Product will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.13 ADJUSTING

- A. Doors: After completing installation, test and adjust doors to operate easily, free of warp, twist, or distortion.
- B. Door Hardware: Adjust and check each operating item of door hardware and each door to ensure proper operation and function of every unit. Replace units that cannot be adjusted to operate as intended.
- C. Windows: Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and at weather stripping to ensure smooth operation and weathertight closure. Lubricate hardware and moving parts.

3.14 CLEANING AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

- B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- C. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.
 - 1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
 - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- D. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
 - 1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- E. Doors and Frames: Immediately after installation, sand rusted or damaged areas of prime coat until smooth and apply touchup of compatible air-drying primer.
 - 1. Immediately before final inspection, remove protective wrappings from doors and frames.
- F. Windows: Clean metal surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances. Clean factory-glazed glass immediately after installing windows.

END OF SECTION 133419

SECTION 210000 – FIRE PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Attention is directed to the general and supplementary conditions and Division 1 including all sub-divisions thereof, as listed in the table of contents, which are hereby made a part of this Section.
- B. All work shall comply with all federal, state and local codes and any other authorities having jurisdiction.
- 1.2 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:
 - A. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors". The following shall appear on the upper left hand of the envelope:

Name of Sub-Bidder: <u>Print Name of Sub-bidder</u>

Project: <u>REGIONAL EMERGENCY COMMUNICATIONS CENTER</u>

Sub-Bid for Section: 210000 - FIRE PROTECTION

- B. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 in person, or by written request.
- C. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.
- D. Additional Requirements:
 - 1. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:
 - 2. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does

customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

| Class of Work | Reference Specification | Paragraphs |
|---------------|-------------------------|------------|
| | | |
| | | |
| | | |

E. The work done by this sub-bidder is shown on the following drawings:

| T1.0 | TITLE SHEET |
|-----------------|--|
| | |
| CIVIL | |
| C1 | EXISTING CONDITIONS |
| C2 | DEMOLITION PLAN |
| C3 | EROSION AND SEDIMENT CONTROL |
| C4.1 | SITE PLAN (BASE BID) |
| C4.2 | SITE PLAN (ALTERNATES) |
| C5 | DRAINAGE AND UTILITIES |
| C6 | DETAILS |
| | |
| ARCHITECTURAL | |
| D1.0 | DEMOLITION PLAN-EXISTING PLAN & ELEVATIONS |
| A1.0 | EXISTING FOUNDATION WORK PLAN & DETAILS |
| A1.1 | FLOOR PLAN & DETAILS |
| A1.2 | FIRST FLOOR PLAN - ENLARGED |
| A1.3 | ROOF PLAN & DETAILS |
| A1.4 | COVERED TRAILER STORAGE |
| A2.1 | ELEVATIONS |
| A3.1 | BUILDING SECTIONS |
| A4.1 | WALL SECTIONS |
| A4.2 | WALL SECTIONS |
| A5.1 | SECTION DETAILS |
| A6.1 | INTERIOR ELEVATIONS |
| A6.2 | INTERIOR ELEVATIONS |
| A6.3 | INTERIOR ELEVATIONS |
| A7.1 | REFLECTED CEILING PLANS |
| A8.1 | SCHEDULES & DETAILS |
| | |
| FIRE PROTECTION | |
| FP0.1 | FIRE PROTECTION LEGEND, NOTES & DETAILS |
| FP0.2 | FIRE PROTECTION DETAILS |
| FP2.0 | FIRE PROTECTION DEMOLITION PLAN |
| FP3.1 | FIRE PROTECTION FLOOR PLANS |

| PLUMBING | |
|------------|---|
| P0.1 | PLUMBING LEGEND, NOTES & SCHEDULES |
| P0.2 | PLUMBING DETAILS |
| P2.0 | PLUMBING DEMOLITION PLAN |
| P3.1 | PLUMBING FLOOR PLANS |
| P3.2 | PLUMBING FLOOR PLANS |
| | |
| HVAC | |
| H0.1 | HVAC LEGEND & GENERAL NOTES |
| H0.2 | HVAC LEGEND & GENERAL NOTES |
| H0.3 | HVAC SCHEDULES |
| H0.4 | HVAC DETAILS |
| H0.5 | HVAC DETAILS |
| H0.6 | HVAC CONTROLS |
| H1.1 | HVAC DEMOLITION PLAN |
| H2.1 | HVAC LEVEL 1 FLOOR PLAN |
| H2.2 | HVAC ROOF PLAN |
| | |
| ELECTRICAL | |
| E0.1 | ELECTRICAL LEGEND AND NOTES |
| E0.2 | ELECTRICAL SYSTEMS RISER DIAGRAMS |
| E0.3 | ELECTRICAL SYSTEMS RISER DIAGRAMS |
| E0.4 | ELECTRICAL SCHEDULES |
| E0.5 | ELECTRICAL DETAILS |
| E0.6 | ELECTRICAL DETAILS |
| E1.0 | ELECTRICAL SITE PLAN |
| E2.0 | FIRST FLOOR PLAN ELECTRICAL DEMOLITION |
| E3.0 | FIRST FLOOR PLAN LIGHTING PLAN |
| E3.1 | FIRST FLOOR PLAN ELECTRICAL POWER PLAN |
| E3.2 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART |
| | PLAN |
| E3.3 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART |
| | PLAN |
| E3.4 | FIRST FLOOR PLAN ELECTRICAL FIRE ALARM PLAN |
| E3.5 | FIRST FLOOR PLAN ELECTRICAL SECURITY PLAN |
| E3.6 | ROOF ELECTRICAL PLAN |
| E3.7 | ROOF ELECTRICAL LIGHTING PROTECTION PLAN |

1.3 SCOPE

- A. Perform work and provide material and equipment as required for a complete and operational automatic sprinkler, and clean agent suppression systems as shown on the Drawings and as specified in this Section. Completely coordinate with work of other trades and provide for complete and fully functional installation.
- B. The work shall include, but is not limited to, the following major items of work:

- 1. Complete and operational wet automatic sprinkler system connected to the existing 6" fire service main. The system shall include all valves, piping, supports, wet system accessories and such other standard accessories as are necessary for a complete approved system.
- 2. Complete and operational double interlock dry automatic sprinkler system connected to the existing 6" fire service main.
- 3. Design and installation of an engineered fire detection and INERGEN total flooding, gaseous agent, fire suppression system as manufactured by Tyco Fire Protection Products (hereinafter referred to as "Tyco"), Marinette, Wisconsin. System design is based on the use of Selector valves to direct the flow of INERGEN agent into the protected zone where indicated on drawings. Quantity of INERGEN cylinders is to be based on the largest zone of protection. Cylinders shall be provided to offer adequate protection of the largest zone of protection. Selector valves shall be provided to supply discharge of proper design concentration of INERGEN agent into the protected zone. Drawings: The contract drawings indicate the general arrangements of the areas to receive detection and INERGEN system protection. Contractor is to review all drawings so that all items affecting the operation of the fire detection/INERGEN fire suppression system (such as equipment location, air diffusers, damper closures, and door openings) are considered in the design of the engineered system. The systems shall be installed with all incidentals necessary for a complete operational system and shall include all piping, insulation, valves, stops, backflow preventers, gauges, structural support and such other standard or specified accessories as are necessary for a complete approved system.
- 4. Demolition of all existing aboveground sprinkler system components and accessories.
- 5. Furnish Access Panels for installation by others.
- 6. This Contractor shall be responsible for all seismic support for all suppression system components and equipment.
- 7. Obtain all permits and approvals required for work under this Section.
- C. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. SECTION GENERAL CONDITIONS OF THE CONTRACT.
 - a. Cutting, patching, and drilling, except installation of pipe supports and fastenings.
 - b. All patching.
 - 2. SECTION 09901 PAINTING.
 - a. All painting.
 - 3. SECTION 230000 HEATING, VENTILATING, AND AIR CONDITIONING.
 - 4. SECTION 260000 ELECTRICAL WORK.
- D. Extent: The work required under this Section, without limiting the generality thereof, includes the furnishing of all labor, materials, equipment, and services necessary for, and reasonably incidental to, the complete installation of all piping, valves, pumps, fixtures,

insulation of piping, and all other materials, equipment, and labor necessary, whether or not such items are specifically indicated on the Drawings or in the Specifications, to complete the plumbing system in all respects ready for continuous and trouble free operation.

E. Intent: It is the intent of the Contract Documents to include all work and materials necessary for erecting complete, ready for continuous use, all plumbing systems as shown on the accompanying Drawings or as hereinafter described. These Drawings shall be taken in a sense as diagrammatic; sizes of pipes and methods of running them are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that will be encountered during the installation of the work.

1.4 CODES, STANDARDS AND REFERENCES

- A. All materials and workmanship shall comply with the latest editions of all applicable Codes, Local and State Ordinances, Industry Standards and Regulations.
- B. The Fire Protection Subcontractor shall notify the Architect/Engineer of any discrepancies between the Contract Documents and applicable Codes, Standards, etc.
- C. In the event of a conflict, the most stringent requirements shall apply.
- D. The following Codes, Standards and References shall be utilized as applicable:
 - 1. Massachusetts State Building Code, 8th Edition.
 - 2. National Electric Code (NEC).
 - 3. Environmental Protection Agency (EPA).
 - 4. Commonwealth of Massachusetts Department of Environmental Protection (DEP).
 - 5. Local Ordinances, Regulations of City of Worcester.
 - 6. National Fire Protection Association (NFPA).
 - 7. Insurance Services Organization (ISO).
 - 8. American National Standards Institute (ANSI).
 - 9. American Society of Mechanical Engineers (ASME).
 - 10. American Society for Testing and Materials (ASTM).
 - 11. American Welding Society (AWS).
 - 12. Commercial Standards, U.S. Department of Commerce (CS).
 - 13. National Electrical Manufacturers Association (NEMA).
 - 14. American Gas Association (AGA).
 - 15. Underwriters' Laboratories, Inc. (UL).
 - 16. Massachusetts Uniform State Plumbing Code.
 - 17. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
 - 18. Manufacturers Standardization Society of the Valve and Fitting Industry (MSS).
 - 19. Architectural Access Board (AAB).
 - 20. Americans with Disabilities Act (ADA).

1.5 COORDINATION

A. Before starting work, visit site and examine conditions under which work shall be performed including preparatory work by others. Report conditions which might adversely affect the work in writing to the Architect. Do not proceed with the work until the defects

have been corrected and conditions are satisfactory. Commencement of work shall be construed as acceptance of preparatory work and existing conditions.

- B. Completely coordinate with work of other trades and provide for complete and fully functional installation. Although not specifically shown, provide supplementary or miscellaneous items, devices, appurtenances and materials incidental to or necessary for sound, secure and complete installation.
- C. This contractor is responsible for sleeving and coring all penetrations associated with the respective work. The General Contractor shall be responsible for firestopping all penetrations in accordance with section 07270 Firestopping. This contractor must fully coordinate with the G.C. so as to identify all the locations requiring firestopping.
- D. All piping and equipment running within trusses must be supported from top chord of truss at panel point. For any alternate configurations or for heavy pieces of equipment coordinate fully with structural engineer for support location before installation.

1.6 GUARANTEE

- A. Guarantee work performed under this Section in accordance with Division 1, General Requirements. Operation of systems or equipment for temporary services does not constitute beginning of guarantee period.
- B. The Contractor also agrees to furnish service of the equipment for the above period, such service to be rendered quickly and promptly at the request of the Owner. This shall not be misconstrued to include routine maintenance.

1.7 CONTRACT DOCUMENTS

- A. Fire Protection drawings do not limit responsibility of determining full extent of work required by Contract Documents. Locations shown on drawings shall be checked against construction proper.
- B. Drawings are diagrammatic and indicate general arrangement of systems and work of this Contract.

1.8 DISCREPANCIES IN DOCUMENTS

- A. Where Drawings or Specifications indicate discrepancies or are unclear, advise Architect in writing before award of Contract. Otherwise, Architect's interpretation of documents shall be final and no additional compensation shall be permitted due to discrepancies or unclear items.
- B. Where Drawings or Specifications do not coincide with recommendations of the manufacturer of a material or piece of equipment, this shall be brought to the attention of the Architect in writing before installation of item in question. Otherwise, make changes in installation, as Architect requires without additional cost to the Owner.
- 1.9 RECORD DRAWINGS

A. Maintain record drawings during construction in accordance with the General Conditions of the Contract.

1.10 PERMITS, FEES, RULES AND REGULATIONS

- A. Refer to Bidding and Contracting Requirements, including Document 00700, GENERAL CONDITIONS and Documents 00800, SUPPLEMENTARY CONDITIONS, for requirements all of which shall be included as part of this Specification.
- B. Give the proper Authorities all requisite notices or information relating to the work under this Section. Obtain and pay for all fees, licenses, permits and certificates. Comply with the rules and regulations of all Local, State and Federal Authorities having jurisdiction, the Codes, Standards, recommended practices and manuals of the National Fire Protection Association, I.S.O., and the Public Utilities Companies serving the building.

1.11 SUBMITTALS

- A. Refer to Section 01300, SUBMITTALS for submittal provisions and procedures.
- B. Submit six (6) copies of shop drawings and product data to Architect for approval. Any deviation from the Contract Documents, or proposed substitution of materials or equipment for those specified, must be requested by the Contractor in a separate letter, whether the deviations are due to field conditions, standard shop practices or other cause. Where any deviation or substitution is permitted, the Contractor shall fully coordinate all related changes to Architectural, Structural, Plumbing, HVAC, Electrical or other work, and shall accomplish these related changes at no additional cost to the Owner. Refer to the general submittal requirements.
- C. Submit shop drawing or product data for the following:
 - 1. Piping, Fittings, Couplings and Accessories.
 - 2. Control Valve, and Drain Valves.
 - 3. Flow and Tamper (Supervisory) Switches.
 - 4. Sprinkler Heads.
 - 5. Working Plans (Shop Drawings) and hydraulic calculations, stamped by a Professional Engineer which shall have the approval of the Local fire department and Owner's insurance underwriter.
 - 6. Wet system and Dry system alarm valves and trim.
 - 7. Backflow Preventer.
 - 8. Fire department connections shall be submitted to the local fire department for approval.
 - 9. Fire department hose valves shall be submitted to the local fire department for approval.
 - 10. Electric alarm bell.
 - 11. Clean agent suppression system components with shop drawings.
 - 12. Do not release for shipment, deliver, or install any equipment or material without prior approval of the Architect-Engineer.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: The Fire Protection Subcontractor shall provide for the delivery of all his materials and fixtures to the building site when required so as to carry on his work efficiently and to avoid delaying his work and that of other trades.
- B. Storage and Handling: The Fire Protection Subcontractor shall, at all times, fully protect his work and materials from injury or loss by others. Any injury or loss, which may occur, shall be made good without expense to the Owner. The Plumbing Subcontractor shall be responsible for the proper protection of all his materials until the building is accepted by the Owner.
- 1.13 CONTINUITY OF SERVICE AND SCHEDULING OF WORK
 - A. Refer to the overall scheduling of the work of the project. Schedule work to conform to this schedule and install work to not delay nor interfere with the progress of the project.
- 1.14 CERTIFICATES OF APPROVAL
 - A. Upon completion of all work, furnish, in duplicate, certificates of inspection.
- 1.15 OPERATING AND MAINTENANCE INSTRUCTIONS
 - A. Prior to the final inspection, the Plumbing Contractor shall provide to the Architect three (3) sets of operating and maintenance instructions. The Architect shall review the instructions for completeness prior to turning them over to the Owner.
 - B. Instructions: The Contractor shall provide qualified, factory-trained manufacturers' representative to give detailed instruction to assigned Owner personnel in the operation and complete maintenance for all equipment. All such training will be at the job site.
 - C. Provide name, address, and telephone number of the manufacturer's representative and service company for each piece of equipment so that the source of replacement parts and service for each item of equipment can be readily obtainable.

1.16 SEISMIC RESTRAINTS

A. Installation of Fire Protection accessories and components shall be in accordance with the Seismic Requirements identified in the Massachusetts State Building Code, Eighth (8th) Edition and NFPA 13.

PART 2 - PRODUCTS

2.1 PIPE, FITTINGS AND JOINTS

A. Piping and fittings shall conform to the latest ANSI, ASTM, and NFPA and AWWA Standards including latest amendments and shall be in conformance with state and local codes and applicable sections of NFPA standards material standards. The fire protection piping shall be carried out to the existing city water supply by the sprinkler contractor and the final connection to the city water supply shall be by the sprinkler contractor. All work

associated with the fire protection main throughout the site including connections to each building and to the city water supply shall be the responsibility of the sprinkler contractor. The sprinkler contractor shall coordinate with all civil drawings, details and specifications for the installation criteria, methods and materials. All work shall be performed in accordance with NFPA-24.

- B. Each length of pipe, each pipe fitting, trap, materials and/or device used in the respective system shall have cast, stamped or indelibly marked on it, the maker's name or mark, weight and quality of the product when such marking is required by the approved standard that applies.
- C. Service: Fire Protection/Sprinkler Above Ground (2 inches and smaller):
 - 1. Pipe Material: Schedule 40 Black Steel with threaded ends, for wet pipe systems. Dry pipe systems shall be similar except for internally galvanized steel pipe.
 - 2. Fitting Material: Cast Iron 175 psi W.P.
 - 3. Pipe Joint: cast iron Screwed fittings for wet pipe systems.
- D. Service: Fire Protection/Sprinkler Above Ground (2-1/2 inches and larger):
 - 1. Pipe Material:
 - a. Schedule 10 Black Steel with roll groove ends for wet pipe system systems. Dry pipe systems shall be similar except for internally galvanized steel pipe.
 - b. Fire Protection Pipe 2-1/2 inches through 5 inches shall have a minimum wall thickness of Schedule 10; .134 inch wall thickness for 6 inch pipe and .188 inch for 8 and 10 inch pipe. Dry pipe systems shall be similar except for internally galvanized steel pipe.
 - 2. Fitting Material: Malleable Iron 175 psi W.P.
 - 3. Pipe Joint: Roll-Grooved with Victaulic fittings
- E. Joints:
 - 1. Joints in steel pipe above ground shall be threaded/flanged or a listed mechanical compression type coupling consisting of a neoprene collar, ductile iron coupling with zinc plated bolts and nuts all assembled to provide seal.
 - 2. Steel, copper and brass pipe and fittings with threaded ends shall have IPS threads cut clean and true and in conformance with the ANSI Specifications B2 1 for taper threads.
 - 3. Pipe roll grooving shall be in accordance with manufacturer's specifications contained in their latest published literature and NFPA 13.
- F. All sprinkler piping in exposed areas shall be of a type suitable for painting.
- G. The spaces above the ceilings will be a plenum. All piping systems shall be plenum rated.

2.2 VALVES

A. General:

- 1. Shutoff valves on the aboveground Fire Protection System shall be UL, FM butterfly, or OS&Y gate valves on sizes 2 1/2" and larger, valves up to 2" shall be UL, FM Ball Valves. All isolation valves shall be electronically supervised.
- 2. Check valves shall be 175 pound class for fire protection.
- 3. Valves shall be provided with seats suitable for the service intended.
- 4. Where isolation valves or inspectors test and drain valves are installed above suspended ceiling tiles, the ceiling tiles under the valve shall be clearly labeled as to identify the type, function, and location of the isolation valve. The valve control shall be located for accessibility.

2.3 SPRINKLER SYSTEM VALVES

- A. Valves shall be as manufactured by Nibco, Victaulic, Wallworth, Milwaukee, or approved equal.
- B. All valves specified herein shall be UL/FM approved 175 PSI minimum working pressure. All control valves shall be provided with tamper (supervisory) switches. All valves shall be approved for fire protection service.
 - 1. Butterfly valves with integral tamper switch or gate valves with tamper switch shall be provided in all aboveground piping. Butterfly valves 2 1/2" and larger shall be UL/FM approved, with ductile iron body and EPDM rubber-coated, ductile iron one-piece disc and upper stem. The body shall be coated with heat-fused PPS blend meeting UL/ULC and FM requirements for corrosion resistance. Valves 2" and smaller shall be UL/FM approved standard port, end entry ball valves with integral tamper switch and rated for 300 psi. The ball shall be polished type 316 stainless steel with stainless steel stem and TFE seats.
 - 2. Combination Inspectors Test and Drain valves shall be a prefabricated Test Module complete with ductile iron body, combination sight glass, 1/2" corrosion resistant orifice and bronze top works, test valve, drain valve, and rated for 300 psi. The test module shall be threaded inlet and outlet connections.
 - 3. Check valves shall be UL/FM approved swing check valve with ductile iron body, brass seat, and rubber faced clapper assembly. Provide flanged or roll groove ends as applicable. The valve shall be rated at 175 psi working pressure.
 - 4. O S & Y valves shall be ductile iron body, rising stem and UL/FM approved. All O S & Y valves shall be provided with tamper switches to suit. Provide flanged ends.
 - 5. Fire Department connections shall be as approved by the Peterborough Fire Department.

2.4 HANGERS AND SUPPORTS

- A. Hangers shall be installed, as required, to meet NFPA compliance as to location/spacing.
- B. Hanger material shall be compatible with piping materials with which it comes into contact.
- C. Hangers shall be installed, in addition to the above, at all changes of direction (horizontal and vertical), valves and equipment connections. Hangers shall be located so that their removal is not required to service, assemble or remove equipment.

- D. Horizontal runs may use band hangers up to 4" size. Piping larger than 4" shall be provided with clevis type.
- E. Vertical support shall be by means of riser clamps (anchors with split ring type allowable up to 2" size only) and adjustable pipe support with flange anchored to floor.
- F. Rods, clamps and hangers shall be electro galvanized coated.
- G. All nuts, inserts and hardware shall be stainless steel.
- H. Size of hanger rods shall not be less than the following:
 - 1. 3/4" to 1 1/2" pipe: 3/8" rod.
 - 2. 2" to 3 1/2" pipe: 1/2" rod.
 - 3. 4" to 6" pipe: 5/8" rod.

2.5 SPRINKLER SYSTEM

- A. The new sprinkler system serving the Area indicated shall be automatic, wet type, as noted on Drawings and as manufactured by Viking, Victaulic or Grinnell. All sprinkler systems, valves, piping, hangers, supports, switches, and all associated equipment and material shall be UL listed and or FM approved for use with fire protection systems. All equipment as mentioned above, shall be rated at 175 psi working pressure.
 - 1. System shall be complete packaged with all necessary controls and including, but not limited to the following:
 - a. Sprinkler Heads and Related Piping and Valves.
 - b. Related Check and Shut off Valves.
 - c. Inspector's Test Valves and Drains.
 - d. Wet system and Dry system valves and trim.
 - e. Flow and tamper switches.
 - f. Double check backflow preventer.
 - g. Seismic Bracing.
 - h. Fire Department Connection.
 - i. Hangers and supports.
 - j. Fire Department Hose Valves
 - 2. Systems shall be in accordance with NFPA 13 and 24 latest accepted editions and the rules and regulations of all local authorities and the owner's insurance authority and the New York State Building Code, latest accepted edition.
 - a. All apartment dwelling areas shall be per NFPA-13 in conjunction with residential sprinkler heads.
 - b. All areas outside dwelling units shall be per NFPA-13 in conjunction with quick response sprinkler heads.
 - c. All building supply mains shall be per NFPA-24.
 - 3. The sprinkler systems shall be calculated as follows:

- a. General use building areas outside of dwelling spaces will be calculated as a light hazard occupancy with .10 gpm per remote 1500 square feet and 100 gpm hose stream allowance.
- b. Storage areas will be calculated as an ordinary hazard occupancy group 2 with .20 gpm per remote 1500 square feet and 250 gpm hose stream allowance.
- c. Mechanical and Electrical areas will be calculated as an ordinary hazard occupancy group 1 with .15 gpm per remote 1500 square feet and 250 gpm hose stream allowance, or as an ordinary hazard occupancy group 2 with .20 gpm per remote 1500 square feet and 250 gpm hose stream allowance. Determination between each of the hazards will be dictated by the types of stored materials and the methods of storage in the rooms.
- d. The dry systems will be calculated as an ordinary hazard occupancy group 1 with .15 gpm per remote 1500 square feet and 250 gpm hose stream allowance.
- e. Concealed spaces made of combustible construction material and that require sprinkler coverage in accordance with NFPA-13.
- f. Areas not listed above shall be calculated in accordance with NFPA-13.
- g. Design areas are not indicated on the sprinkler system drawings. It shall be the responsibility of the sprinkler contractor to select all design areas and to indicate these design areas as well as their associated design densities on the sprinkler contractors sprinkler system shop drawings. The sprinkler contractor shall select all design areas and design densities in accordance with NFPA-13.
- B. Sprinkler Heads:
 - 1. Sprinkler heads shall be installed in accordance with architectural ceilings in all areas. Coordinate with the architectural ceiling plans and the electrical lighting plans for exact locations of ceilings and light fixtures and for laying out all final locations of sprinkler heads and piping. All sprinkler heads in suspended ceilings shall be installed in center of ceiling tiles.
 - 2. Automatic Sprinklers: Sprinklers, in general, shall be automatic closed type with a 1/2 inch nominal size orifice. Unless otherwise indicated on the drawings, temperature rating of fusible elements shall be in accordance with NFPA-13. Automatic sprinklers of ordinary temperature rating shall be used except in areas above normal temperatures, will occur. In such areas high temperature sprinklers shall be provided. High temperature sprinkler heads shall be provided in all mechanical rooms, all electric rooms, all kitchen service areas, all IT rooms and computer equipment rooms, and in all areas where sprinkler heads are in close proximity to heat producing equipment. Sprinkler heads, escutcheon plates and finishes shall be UL listed and or FM approved.
 - 3. All sprinkler heads shall be quick response type. All sprinkler heads shall be provided with manufacturer applied finishes on the cover plates that will match the finishes of the ceilings and walls to which the sprinkler heads will be installed.
 - 4. All dry sidewall and dry recessed pendent sprinkler heads shall be by Tyco, Reliable, Viking and shall be adjustable type with escutcheon plate and quick response type. The dry barrel length of all sprinkler heads shall be determined in the field. However, the dry barrel of these sprinkler heads shall extend into the warm space of the building a minimum of 12". In no case shall the dry barrel length be less than 12". Dry barrel lengths of less than 12" shall not be allowed.

- 5. All sprinkler heads located in ceiling tiles shall be installed in the center of the ceiling tiles
- C. Spare Sprinkler Heads and Cabinet:
 - 1. Provide at each sprinkler alarm check valve, a metal cabinet containing spare sprinkler heads and wrenches.
 - 2. Cabinet shall have shelves for storing the spare sprinkler heads in an orderly manner. The shelf spaces shall be subdivided to segregate the sprinkler heads of each type and clearly identify them with approved markings. Cabinet shall have proper arrangements for hanging the wrenches. Wrenches shall be located so as to be readily accessible.
 - 3. Cabinet shall be dust-tight and red in color, enameled finish. The outside of the cabinet door shall have painted on it in legible and clear lettering "Automatic Sprinklers Reserve Supply" suitable standard instructions pertaining to the sprinkler systems and any other necessary information shall be fastened onto the inside of the cabinet door.
 - 4. The cabinet size and number of each type spare sprinkler heads shall conform to the National Fire Protection Association Pamphlet No. 13.
- D. Tamper (Supervisory) Switches (as required): Provide with each control valve in the system a UL and FM approved tamper-proof monitor switch (N.O.). Wiring of each monitor switch to fire alarm control panel to be provided under Electrical Section 26 0000. Tamper switches shall be provided with two sets of dry contacts.
- E. Flow Switch (as required): Provide UL and FM approved adjustable vane type flow switch on Wet pipe systems. All flow switches shall be provided with adjustable retard devices to prevent false alarm due to water pressure surges. Wiring of each monitor switch to fire alarm control panel to be provided under Electrical Section 26 0000. Flow switches shall be provided with two sets of dry contacts.
- F. Transmitting equipment provided under this Section of the specification for alarm valve and tamper switch alarms located in fire alarm central panel must be compatible in all respects with fire alarm supervisory control system. Refer to Electrical Section 26 0000 for requirements before purchasing transmitting equipment as herein specified for fire protection equipment.
- G. Backflow Preventer:
 - 1. Double check assembly shall be New York D.E.P. approved, complete with OS&Y gate valves, as indicated, on inlet and outlet.
 - 2. Installation of all backflow preventers shall be in accordance with New York State Plumbing Code and Department of Environmental Protection regulations.
 - 3. Provide repair kits for each reduced pressure and double check backflow preventer, and shall register the backflow preventer with the New York D.E.P.
 - 4. The sprinkler contractor shall create a scale drawing showing the installation of the backflow prevention device and shall indicate the make and model number of the device and installation details on the drawing. The sprinkler contractor shall also obtain the backflow manufacturers cut sheet. The drawing and cut sheet information

shall be submitted to the local water authority for approval, and approval shall be obtained, prior to the commencement of any sprinkler work.

- H. Alarm Check Valves:
 - 1. The Wet System Alarm check valve shall be complete with all trim, test and alarm trim, valves, gauges, pressure alarm switches, flow switches, alarm bells, water motor gongs, electric alarm bells, low water pressure alarm switches, retard chamber and drains necessary for operation. The valve and trim shall be UL/FM approved and rated at 175 psi working pressure. The valves shall be for roll groove fittings and shall be manufactured by Viking.
 - 2. Installation and settings for all alarm check valves shall be in strict accordance with the manufacturers recommended installation instructions.
- I. Double Interlock Dry System Valve:
 - 1. Dry alarm valve shall be approved type for a dry pipe sprinkler system, complete with drain valve, priming water valve, ball drip valve, alarm test valve, priming chamber, fill line attachment, pressure gauges and air control valve assembly. Reliable Model D or approved equal.
 - 2. To maintain air pressure in the dry pipe system, furnish and install an air compressor with pressure switch and starter to operate compressor automatically. Compressor to be sized as required for system in accordance with NFPA #13.
 - 3. If required, and to accelerate operation of the dry valve, furnish and install Reliable Model B or approved equal accelerator with integral anti flooding device.
 - 4. Valve trim is to include pressure activated electric alarm switch and low air pressure alarm switch.
- J. Fire Department Connection: The fire department connection shall be as directed by the local fire department. The exact type and location of all fire department connections shall be coordinated with the local fire department, by the sprinkler contractor. Provide signage displaying "AUTOMATIC SPRINKLER FIRE DEPARTMENT CONNECTION", or other fire department approved terminology. The fire department connection and signage for each device shall be approved by the Peterborough Fire Department prior to purchase.
- K. Electric Alarm Bell: The electric alarm bell shall be 120V, rated for outdoor use, and shall come with weatherproof backbox for outdoor installation, underdome strikers and operating mechanisms, and 8" gong, 2 sets of leads for in/out wiring.

2.6 SPRINKLER SHOP DRAWINGS

- A. Provide shop drawings for approval for entire system.
- B. Provide a full set of hydraulic calculations and sprinkler system shop drawings. Hydraulic calculations and drawings shall be complete and correct in every respect in accordance with NFPA 13 latest accepted editions. Final construction design shall be based on the sprinkler contractors hydraulic calculations and sprinkler system shop drawings. All buildings as directed by the architect shall be equipped throughout with an approved automatic fire suppression system.

- C. Prepare working plans and hydraulic calculations stamped by a registered Professional Engineer of all entire systems in accordance with NFPA-13and shall have these drawings and calculations approved by the Peterborough Fire Department and the Owner's insuring authority and so stamped and signed, and submit such stamped and signed drawings to the Architect for approval. No work shall be installed until the drawings have been returned with the above approvals in addition to the Architect's approval.
- D. In addition to the sprinkler system shop drawings, it shall be the responsibility of the sprinkler contractor to create a scale drawing of the layout of the fire sprinkler room and shall indicate all piping, valves, fittings, backflow preventer, wet and dry system risers and valves, drains, gauges and all devices required for a complete fire protection systems installation in accordance with NFPA-13. The sprinkler contractor shall carefully coordinate this room layout with the plumbing contractor to insure that both trades will fit into the space. The sprinkler contractor shall submit the sprinkler room layout to the plumbing contractor for coordination of the plumbing piping, valves and equipment.
- E. The sprinkler contractor shall conduct a new hydrant flow test at the site to obtain current flow and pressure data. The sprinkler contractor shall provide all labor, materials and coordination for the flow test. The sprinkler contractor shall coordinate with the local water department and local fire department prior to conducting the flow test for local authority requirements. The sprinkler contractor shall pay all local authority fees associated with the performing of the hydrant flow test.
- 2.7 SUPPRESSION AGENT
 - A. Suppression Agent:
 - 1. NFPA Designation: IG-541, IG55.
 - 2. IG-541 chemical name: Nitrogen 52%, Argon 40%, Carbon Dioxide 8% Heptafluoropropane, Trifluoromethane.
 - 3. Trade Name: Inergen, NOVEC 1230.
 - B. Hybrid Nitrogen-Water Fire Suppression System
 - 1. System Description
 - a. Unless otherwise specified, protection shall be by a high velocity low pressure dual fluid system capable of making water particles less than 10 microns in size, designed, installed and tested in accordance with NFPA 750 performance based design intent. The system shall incorporate separate pressurized streams of nitrogen and water which are combined and discharged as a hybrid inert gas micro mist (HIGMM) into the fire hazard.
 - b. The combination of the nitrogen gas and water shall be at the emitter, where the nitrogen stream shall be at approximately 170 kPa and the water component shall be at less than 70 kPa.
 - 1) Water shall be introduced into the nitrogen flow downstream of the nitrogen exit orifice to atmosphere.

- 2) A flow cartridge shall be provided for each emitter to ensure a specific water flow of less than 0.06 L/s per emitter shall be provided independent of the water pressure.
- 3) A strainer shall be provided upstream of each flow cartridge to ensure no clogging is permitted.
- c. The mixture of the two components (hybrid) shall be in a shock front, allowing shear forces to atomize the water, creating the hybrid inert gas micro mist of water droplets less than 20µm in diameter, with the majority being less than 10µm in diameter.
- d. This hybrid mixture shall exit the emitter at a high velocity ranging from 6.1 m/s within 450 mm of the emitter to 3.6 m/s 2.4 m from the emitter.
- e. The application mode shall be able to protect via total flooding or as a local application hazard protection.
 - 1) System shall be activated automatically upon detection of a fire with an additional manual activation (optional), if required.
- 2. Extinguishment Mechanism and Test Methodology
 - a. The fire extinguishing system's primary mechanism shall be by lowering the flame temperature to the point where combustion cannot continue based on the critical adiabatic flame concept.
 - b. A secondary mechanism shall be by heat absorption via the fine water particles vaporization from liquid phase to vapor phase.
 - c. The test protocol acceptance criteria shall be in accordance with that set by Factory Mutual (FMRC) and UL. All pre-engineered system design shall have been tested and approved by an internationally recognized third party fire system testing laboratory (e.g., Factory Mutual & UL).
 - d. Documented approval agency testing for machined spaces up to 3500 m3 with scalability beyond 3500 m3, shall be required.
 - e. No ozone depletion potential or Global Warming Characteristic shall be accepted.
- 3. Specification Needs
 - a. When an engineered system is required or specified, the design shall include the following:
 - 1) Engineered systems shall utilize proven fire test data from a recognized international testing agency (e.g., Factory Mutual) as a minimum for the design basis of the proposed system design.
 - 2) The testing referenced shall be based on the specific hazards, equipment packages and the associated enclosure type.
 - 3) The design of engineered systems must clearly demonstrate function and NFPA 750 performance based design intent based on the referenced test data considering volume and water volume density and extinguishing performance for the design when comparing to the test data.

- b. The following items designs shall be submitted to Owner's Representative for approval as a minimum for all the manufacturer's systems:
 - 1) Basis of design including test records showing dimensions of the test rig, emitter layout and test results for each test.
 - 2) System plan and section drawings.
 - 3) Pipe/tubing isometric drawings.
 - 4) Detail drawings calling out all fittings and fitting part numbers.
 - 5) Recommended startup and operational spare parts lists.
 - 6) Commissioning and test instructions and forms.
 - 7) Detection type for release circuits.
 - 8) Installation method, i.e. Turn-key house or assemble on site.
- c. The manufacturer's customer information sheets shall be provided for the hazards and provide detailed drawings to assist in the design and layout of the emitters and submitted to the Owner's Representative. Any further requirements for the system not covered in this specification shall be relayed to the manufacturer's project engineers for their consideration and requisite actions in laying out the proposal.
- d. Owner's Representative approval is required for all fire suppression systems.
- 4. Overall Installation Requirements
 - a. Clear instruction signs shall be posted outside the system hazard area or adjacent to an unenclosed system to ensure correct operation of the system. Recharge and basic maintenance instructions shall also be posted inside the system cabinet or adjacent to the system. Signs and instructions shall be provided on engraved or etched material in English.
- 5. Emitter Requirements
 - a. System shall not require tight enclosures such as with gaseous alternatives.
 - b. Designs shall include emitters to ensure proper coverage of the enclosure. Designs incorporating doorway manifold emitters shall not be allowed.
 - c. All emitters shall be located in the protected space in accordance with the fire suppression system manufacturer's recommendation and the approved preengineered system design. Emitter positioning shall ensure the hybrid inert gas micro mist is uninterrupted and does not directly impinge on adjacent enclosure equipment (e.g., monorails) or mounting supports.
 - d. Emitter covers shall be fitted to all discharge emitters to prevent blockage from corrosion deposits in a marine environment. The emitter covers shall be designed to not interfere with the normal discharge.
 - e. The testing certificate, test protocol including arrangement of emitters and details of test results shall be provided to Owner's Representative.
- 6. Water Supply Requirements
 - a. Unless approved otherwise, pre-engineered fire suppression system shall provide a connected reserve of fluids equal in volume to the initial discharge

supply per NFPA 750 performance based design intent and shall be used for backup. The back-up system for engineered systems shall be equal in volume to the initial discharge supply.

- b. An optional turn-key skid, as indicated, shall be designed for weather or freeze protection unless approved otherwise. An automatic HVAC system shall be provided to keep the skid and equipment between 4° C and 40° C. Storage of the nitrogen cylinders outside is acceptable as long as ambient temperature remains above -29° C.
- c. Shutoff control valves for all fluid paths shall be monitored for proper operative position.
- d. A supply of water shall be confirmed for refilling the water cylinders. Provisions shall be made to simplify the task of periodically draining and refilling water cylinders as required by NFPA 750 performance based design intent. Filters or strainers shall be provided with mesh no larger than 80 percent of the smallest orifice or fluid channel in the system or 100 micrometers (m), whichever is smaller. A system shall be provided to rapidly verify the water cylinders are full by continual monitoring of facilities to enable rapid level confirmation during periodic maintenance.
- e. Water cylinders shall be designed to prevent corrosion. When requested, tanks and cylinders shall be installed on metal or fiberglass grating inside optional cabinets to raise the cylinders above the cabinet floor and avoid corrosion underneath of the cylinders and/or cabinets.
- f. Systems shall be designed to be fully drained of all liquid after discharge to ensure that no piping corrosion or freezing occurs due to residual water. Pitching of the water supply lines shall be provided to ensure drainage back to the panels. Alternatively, where required, manual drains may be installed.
- 7. Nitrogen Supply Requirements
 - a. Cylinders are to be retained in position by metal bands with rubber or synthetic strips fitted to prevent corrosion of the cylinders or metal bands. (Special consideration should be given to Marine applications due to additional motion induced forces.)
 - b. Nitrogen cylinder pressure shall be continually monitored and displayed with a low pressure alarm transmitted to an attended location.
 - c. DOT or ASME approved cylinder tubes shall be provided.
 - d. The nitrogen cylinders, when requested, shall be installed on metal or fiberglass grating inside optional cabinets to raise the cylinders above the cabinet floor and avoid corrosion underneath of the cylinders and/or cabinet.
- 8. General Requirements
 - a. A signal shall be provided to the fire and gas monitoring system confirming when the hybrid inert gas micro mist has discharged.
 - b. All tubing, piping, and fittings for the complete system shall be stainless steel, galvanized, or other corrosion resistant materials. Fittings that do not have wetted surfaces may be ductile iron or equivalent.
 - c. A pressure test of the complete system (discharge pipe, tubing and fittings) shall be carried out in accordance with the requirements of NFPA 750

performance based design intent to ensure the system is free of leaks prior to a final discharge test. A final discharge test is required on every individual system prior to any machine testing or operation to ensure piping and fittings do not come loose due to system shock, that emitters have been positioned correctly with suitable, unobstructed spray patterns.

- C. Agent Storage
 - 1. Capacity: determined by supplier in high pressure seamless steel alloy cylinder.
 - 2. Provide one full set of spare charged cylinders.
 - 3. Standard:
 - a. Manufactured, tested and marked in accordance with DOT/TC Specification 4BW500, 4BA500, 3AA, 3A.
 - b. In accordance with suppression agent manufacturer.
 - 4. Cylinder Assembly:
 - a. Pressure seat type valve equipped with gauge.
 - b. Cylinder pressure supervisor switch to provide a signal at the control panel if the pressure in the cylinder drops to 2206 kPa.
 - c. Protective Cap: threaded steel anti-recoil.
 - d. Installation: free standing steel racks on solid walls.
 - e. Lifting lugs: Cylinders larger than 97 kgs. shall be provided with lifting lugs for ease of handling.
 - f. Brackets: Integral brackets to be provided for secure mounting.
 - g. Discharge Valve:
 - 1) Material: machined brass forging.
 - 2) Design: Pressure seated, high flow rate design incorporating a brass piston with seal, pressure releasing for valve operation, safety disc assembly, pressure actuation outlet port and pressure gauge.
- D. Releasing Device
 - 1. Detection: To signal automatic release and/or alarm by optical type smoke detectors and/or heat (rate compensated) detectors signalling the control panel.
 - 2. Alarms:
 - a. Type: horn/strobe.
 - 3. Locations:
 - a. To alert personnel located in the protected areas.
 - b. At entrances to protected areas.
 - 4. Operation:
 - a. Automatic release solenoid-operated valve on cylinder that causes discharge of agent from storage containers in the system.

- b. Program control panel to provide an adequate pre-discharge alarm period at time of system test to ensure personnel safety.
- 5. Supervision: Each releasing device shall be separately series supervised and activated by an output directly from control panel.
- 6. Features:
 - a. The releasing device shall be easily removable from container valve without emptying container.
 - b. While removed from container valve, releasing device shall be capable of being operated, with no replacement of parts required after this operation.
- E. Manual Override
 - 1. Manual lever actuator for override applications.
- F. Check Valve
 - 1. For each cylinder connected to a common manifold.
- G. Transfer Switch
 - 1. Operation: manual.
- H. Selector Valve
 - 1. Operation:
 - a. Pressure operated and self restoring.
 - b. Released by pilot operators which can be operated directly, by remote pressure source and/or electric solenoid.
- I. Pressure Reducer
 - 1. Orifice Plate:
 - a. Stainless steel.
 - b. Orifice size as required.
- J. Auxiliary Switches
 - 1. General: to ANSI/NFPA 13 and ULC listed for fire service.
 - a. Type:
 - 1) Normally open and normally closed contacts with supervisory capability, pressure operated upon release of clean agent into discharge piping.
 - 2) Heavy duty, double pole, single throw, two to a unit.
 - 3) Complete with manual operator for test and reset.

- b. Signal:
 - 1) Shut down of electric power to ventilation system.
 - 2) Shut down of electric powered equipment within the hazard.
 - 3) An alarm.
- K. Pressure Operated Releases
 - 1. Function: to release self-closing devices operating doors, dampers, windows, louvers, lids, valves.
- L. Discharge Nozzles
 - 1. Coverage: in accordance with NFPA 2001.
 - 2. Size: as required.
 - 3. Dispersion Pattern: 1800 or 3600 as required.
 - 4. Material: aluminum or brass corrosion resistant construction and specifically designed for specified clean agent application.
 - 5. Markings: Permanently marked as to type part number and orifice size.
 - 6. Pipe thread: Standard female corresponding to nozzle size for attachment to discharge piping.
 - 7. Standards: UL listed.
- M. Distribution Pipe And Fittings
 - 1. Material: Galvanized steel in accordance with NFPA 2001.
 - 2. Pipe wall thickness: to ASME B31.1.
 - 3. Pipe junctions:
 - a. NPS 2 and smaller to be threaded.
 - b. Greater than NPS 2 to be welded or grooved.
 - 4. Piping design:
 - a. To NFPA 2001.
 - b. Routing: Layout piping to give maximum flow and to avoid possible mechanical, chemical or other damage.
 - 5. Pipe threads: to ANSI B1.20.1.
 - 6. Pipe reductions: butt weld concentric reducers, swaged nipples or weld-o-lets.
 - 7. Screwed pipe reductions: screwed concentric reducing fittings or swaged nipples.
 - 8. Non-corrosive pipe: Hot-dipped galvanized inside and out.
- N. Pipe Sleeves
 - 1. Sleeve piping through building walls, partitions, floor slabs, roof slabs.
 - 2. Material: Schedule 40 steel pipes at two sizes (min.) greater than the pipe being sleeved.
 - 3. Extend sleeves through floor slabs minimum 50 mm above the floor.

- 4. Extend sleeves through roof slabs to permit clearance for roofing and flashing material.
- O. Pipe Hangers And Supports
 - 1. To ANSI B31.1.
 - 2. Hanger material: steel.
- P. Accessories
 - 1. Cylinder weighing:
 - a. Provide rack uprights with a weigh bar spanning the rack for support of a portable weighing device.
 - b. Provide a portable direct reading beam scale for weighing cylinders in place by loosening cylinder clamps and disconnecting the discharge heads without disconnection of any control components.
 - 2. Cylinders with a capacity of 97 kgs. or more shall be fitted with a liquid level indicating device.
 - a. Provide a graph to translate the device reading to pounds or kilograms of clean agent at the cylinder temperature.

PART 3 - EXECUTION

3.1 STRUCTURAL SYSTEM

A. The sprinkler systems shall be installed in such a way that no portion of the building structural system shall be altered in any way. In no case shall it be acceptable for any load bearing walls, beams, columns, bracing, joists or any portion of the building structural system to be cut, cored, drilled or altered in any way.

3.2 FIRE PROTECTION SYSTEMS

- A. Comply with rules, codes, ordinances, regulations and requirements of all legally constituted authorities having jurisdiction over the whole, or any part of the work herein specified. These rules and regulations supplement this Specification and shall take precedence in any case of conflict.
- B. Materials and equipment furnished in connection with the installations shall be new and furnished in accordance with the requirements of the Standards of the NFPA Bulletin Nos. 13 and they shall be the best grade and quality of their respective kinds, free from natural, manufacturing or construction flaws, deflects or irregularities and the finish, fitting and workmanship shall be equal to the highest commercial grade.

- C. Fire Protection System shall be installed in such a manner as to harmonize with the special architectural features of the building. All information required concerning the special architectural features of the building may be obtained from the Contract Documents.
- D. Systems shall include, but are not limited to, sprinkler heads and escutcheons, control valves, check valves, electric alarms, piping, fittings, hangers, drains, Inspector's test connections, flow switches, control valve monitor switches, signs and other identification markings as required.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Piping Installation:

- 1. Piping shall be installed straight and direct as possible forming right angles or parallel lines with building walls, other piping and neatly spaced.
- 2. The horizontal runs of piping, except where concealed in partitions, shall be installed as high as possible.
- 3. Piping or other apparatus shall not be installed in such a manner so as to not interfere with the full swing of the doors and access to other equipment.
- 4. The arrangement, positions and connections of pipes, drains, valves, and the like, indicated on the drawings shall be followed as closely as possible, but the right is reserved by the Architect to change locations and elevations to accommodate the work, without additional compensation for such change.
- 5. It shall be possible to drain the water from all sections of each aboveground sprinkler piping system. Pitch piping back to drain valves.
- 6. Screwed piping of brass or chrome plated brass shall be made up with special care to avoid marring or damaging pipe and fitting exterior and interior surfaces.
- 7. Small fittings shall be screwed up close to the shoulders of male threads. Lampwick, cord, wool, or any other similar material shall not be used to make up thread joints.
- 8. Screwed pipe and copper tubing shall be reamed smooth before installation.
- 9. Reducing fittings, unless otherwise approved in special cases, shall be provided in making reduction in size of pipe. Bushings will not be allowed.
- 10. Vertical risers shall be firmly supported by riser clamps, properly installed to relieve all weight from the fittings.
- 11. Any piece of pipe six inches or less in length shall be considered a nipple.
- 12. All fire protection service piping shall be kept a sufficient distance from other work to permit finished covering to be not less than 1 inch from other work.
- 13. The pipe and fittings shall be manufactured in the United States of America and in accordance with the Commercial Standards, American National Standards Institute and American Society of Testing Materials.
- 14. All work associated with the grooving, threading, or cutting of piping shall be done outside of the building. Finished pipe sections shall be brought into the building and care shall be taken so as not to damage pipe ends. No pipe cutting or grooving equipment will be allowed inside the building.
- 15. After all work and testing are complete and after acceptance of the system, the all debris, tools, equipment, etc., from the work areas both inside and outside the building.
- 16. Special care shall be given when making pipe joint connections so as not to produce leaks or dampness around the joints. During pressure testing, any dampness detected

around joints and couplings shall be fixed by disassembling the joint or coupling, thoroughly cleaning and drying the pipe and couplings, reassembling the joint or coupling, and re-testing the sprinkler system.

- 17. Victaulic "Pressfit" system shall be installed in strict accordance with the manufacturer's instructions and all applicable codes.
- B. Hanger Installation:
 - 1. All piping shall be supported from the building structure by means of approved hangers and supports, to maintain proper grading and pitching of lines, to prevent vibration and to secure piping in place, and shall be so arranged as to provide for expansion and contraction.
 - 2. Vertical hanger rods to support piping from the structure or supplementary steel shall not exceed four feet in total length vertically, provide factory fabricated channels and all associated accessories.
 - 3. Friction clamps shall be installed at the base of the risers and at each floor (above or below floor slabs). Friction clamps installed above floor slabs shall not be supported from or rest on floor sleeves.
 - 4. Provide hangers at a maximum distance of two feet from all changes in direction (horizontal and vertical), on both sides of concentrated loads (equipment) and at valves.
 - 5. Hangers, in general, for all horizontal piping shall be A Band type hangers for piping up to 4" size and Clevis type for piping 5" and larger.
 - 6. Provide all supplementary steel including factory fabricated channels and associated accessories throughout both suspended and floor mounted, subject to the approval of the Architect.
 - 7. Wire, tape or wood fastenings for shims or support of any pipe or tubing shall not be used.
 - 8. Remove all rust from the ferrous galvanized hanger equipment (hangers and rods) and apply one coat of galvanized paint immediately after erection.
 - 9. Piping at all equipment and each control valve shall be supported to prevent strains or distortions in the connected equipment and control valves. Piping and equipment shall be supported to allow for removal of equipment, valves and accessories with a minimum of dismantling and without requiring additional support after these items are removed.
 - 10. All piping shall be independently supported from the building structure and not from the piping, ductwork, conduit or ceiling suspension systems of other systems.
 - 11. Installation of hangers which permit wide lateral motion of any pipe will not be acceptable.
 - 12. All hangers in contact with uninsulated piping shall be compatible with piping material.
- C. Installation of Sleeves, Inserts and Escutcheons:
 - 1. Sleeves in floors shall set one (1) inch above the finished floor surface or as indicated on the Architectural Drawings.
 - 2. Sleeves through interior masonry or non masonry walls or partitions shall be set flush with the finished surfaces of the wall or partition.

- 3. Provide field drilling for inserts required for work under this section of the specifications.
- 4. Each interior wall or partition sleeve shall be packed with foam, glass wool or approved substitute flush with each face of wall.
- 5. Escutcheons shall be installed around all exposed piping passing through floor, wall or ceiling. Escutcheons shall fit snugly around the bare or insulated pipe.

3.4 MISCELLANEOUS IRON AND STEEL

- A. Provide steel supports and hangers as shown on the drawings or required to support valves, pipe, ductwork, and other equipment or materials.
- B. All work shall be cut, assembled, welded and finished by skilled mechanics. Welds shall be ground smooth. Stands, brackets, and framework shall be properly sized and firmly constructed.
- C. Measurements shall be taken on the job and worked out to suit adjoining and connecting work. All work shall be by experienced metal working mechanics. Members shall be straight and true and accurately fitted. Scale, rust, and burrs shall be removed. Welded joints shall be ground smooth where exposed. Drilling, cutting and fitting shall be done as required to properly install the work and accommodate the work of other trades as directed by them.
- D. Members shall be generally welded, except that bolting may be used for field assembly where welding would be impractical. Welders shall be skilled.
- E. All shop fabricated iron and steel work shall be cleaned and dried and given a shop coat of paint on all surfaces and in all openings and crevices.
- F. Submit details of all equipment supports and attachments for approval.

3.5 TESTING

- A. General:
 - 1. Provide all labor, materials, instruments, devices and power required for testing. The tests shall be performed in the presence and to the satisfaction of the Architect, Fire Department and the Owners Insurance Authority, and such other parties as may have legal jurisdiction. No piping in any location shall be closed up, furred in, or covered before testing.
 - 2. Where portions of piping systems are to be covered or concealed before completion of the project, those portions shall be tested separately in the manner specified herein for the respective entire system.
 - 3. Any piping or equipment that has been left unprotected and subject to mechanical or other injury in the opinion of the Architect shall be retested in part or in whole as directed.
 - 4. The Architect retains the right to request a recheck or resetting of any instrument during the guarantee period at no additional cost to the Owner.

- 5. Repair, or if directed, replace any defective work with new work without extra charge to the Contract. Repeat tests as directed, until the work is proven to meet the requirements specified herein.
- 6. Restore to its finished condition any work, damaged or disturbed, provided by other trades and engage the original trade to do the work of restoration to the damaged or disturbed work.
- 7. Caulking of screwed joints or holes in piping will not be acceptable.
- 8. Notify the Architect, Peterborough Fire Department, The Owner, the Owners Insurance Authority, and any inspectors having jurisdiction, a minimum of 48 hours in advance of making any required tests so that arrangements may be made for their presence to witness his scheduled tests.
- B. Sprinkler Systems:
 - 1. Testing shall be in accordance with NFPA-13, 13, and NFPA-24, latest accepted edition.
 - 2. Each system shall be tested to a hydrostatic pressure of 200 PSI for two hours.
 - 3. Flushing shall be performed at a minimum rate of 390 GPM for systems supplied by a 4" alarm valve and 880 GPM for systems with a 6" alarm valve. No portion of the fire protections systems shall be connected to the site water supplies until the site water mains have been flushed and Flushing reports have been provided to the sprinkler trade by the site trade.
 - 4. All water flow detecting devices and circuits shall be flow tested through the inspector's test connection and activate within five minutes of initiation.

3.6 CLEANING AND ADJUSTING

- A. At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by operation of the system for testing.
- B. Any stoppage or discoloration or other damage to parts of the building, its finish, or furnishings, due to failure to properly clean the piping system shall be repaired at no increase in Contract costs.
- C. All items of equipment shall be thoroughly inspected and any items dented, scratched or otherwise damaged in any manner shall be replaced or repaired and painted to match the original finish. All items so repaired and refinished shall be brought to the attention of the Construction Manager for inspection and approval.
- D. Continuously remove debris from work areas and remove debris, waste, scrap, excess materials, etc., from the work on completion in any area.

3.7 SPECIAL TOOLS

- A. Provide any and all special tools, recommended by the manufacturer of items furnished, noted as not being commonly available.
- 3.8 CERTIFICATES OF APPROVAL

- A. Upon completion of the work, furnish to the Owner in duplicate, certificates of inspection and/or approval from state and local inspection authorities having jurisdiction indicating the installed systems compliance to their requirements and the sprinkler installer fire protection engineer affidavit for each building.
- 3.9 PAINTING AND EARTHWORK
 - A. All painting shall be provided under Section 09 9100 Painting.
 - B. All painting and earthwork shall be provided in accordance with Section 31 0000 Building Earthwork

END OF SECTION 210000

SECTION 220000 - PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Attention is directed to the general and supplementary conditions and Division 1 including all sub-divisions thereof, as listed in the table of contents, which are hereby made a part of this Section.
- B. All work shall comply with all federal, state and local codes and any other authorities having jurisdiction.
- 1.2 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:
 - A. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors". The following shall appear on the upper left hand of the envelope:

| Name of Sub-Bidder: | Print Name of Sub-bidder |
|----------------------|--|
| Project: | REGIONAL EMERGENCY COMMUNICATIONS CENTER |
| Sub-Bid for Section: | <u> 220000 – PLUMBING</u> |

- B. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 in person, or by written request.
- C. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.
- D. Additional Requirements:
 - 1. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:
 - 2. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that subsubtrade requires such listing, provided that, in the absence of a contrary

provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

| Class of Work | Reference Specification | Paragraphs |
|---------------|-------------------------|------------|
| | | |
| | | |
| | | |

E. The work done by this sub-bidder is shown on the following drawings:

| T1.0 | TITLE SHEET |
|---------------|--|
| | |
| CIVIL | |
| C1 | EXISTING CONDITIONS |
| C2 | DEMOLITION PLAN |
| C3 | EROSION AND SEDIMENT CONTROL |
| C4.1 | SITE PLAN (BASE BID) |
| C4.2 | SITE PLAN (ALTERNATES) |
| C5 | DRAINAGE AND UTILITIES |
| C6 | DETAILS |
| | |
| ARCHITECTURAL | |
| D1.0 | DEMOLITION PLAN-EXISTING PLAN & ELEVATIONS |
| A1.0 | EXISTING FOUNDATION WORK PLAN & DETAILS |
| A1.1 | |
| A1.2 | FIRST FLOOR PLAN - ENLARGED |
| A1.3 | ROOF PLAN & DETAILS |
| A1.4 | COVERED TRAILER STORAGE |
| A2.1 | ELEVATIONS |
| A3.1 | BUILDING SECTIONS |
| A4.1 | WALL SECTIONS |
| A4.2 | WALL SECTIONS |
| A5.1 | SECTION DETAILS |
| A6.1 | INTERIOR ELEVATIONS |
| A6.2 | INTERIOR ELEVATIONS |
| A6.3 | INTERIOR ELEVATIONS |
| A7.1 | REFLECTED CEILING PLANS |
| A8.1 | SCHEDULES & DETAILS |
| | |
| FIRE | |

| PROTECTION | |
|------------|---|
| FP0.1 | FIRE PROTECTION LEGEND, NOTES & DETAILS |
| FP0.2 | FIRE PROTECTION DETAILS |
| FP2.0 | |
| FP3.1 | FIRE PROTECTION FLOOR PLANS |
| PLUMBING | |
| P0.1 | PLUMBING LEGEND. NOTES & SCHEDULES |
| P0 2 | PLUMBING DETAILS |
| P2.0 | |
| P3.1 | PLUMBING FLOOR PLANS |
| P3.2 | PLUMBING FLOOR PLANS |
| | |
| HVAC | |
| H0.1 | HVAC LEGEND & GENERAL NOTES |
| H0.2 | HVAC LEGEND & GENERAL NOTES |
| H0.3 | · |
| H0.4 | HVAC DETAILS |
| H0.5 | HVAC DETAILS |
| H0.6 | HVAC CONTROLS |
| H1.1 | HVAC DEMOLITION PLAN |
| H2.1 | HVAC LEVEL 1 FLOOR PLAN |
| H2.2 | HVAC ROOF PLAN |
| | |
| ELECTRICAL | |
| E0.1 | ELECTRICAL LEGEND AND NOTES |
| E0.2 | ELECTRICAL SYSTEMS RISER DIAGRAMS |
| E0.3 | |
| E0.4 | ELECTRICAL SCHEDULES |
| E0.5 | ELECTRICAL DETAILS |
| E0.6 | ELECTRICAL DETAILS |
| E1.0 | ELECTRICAL SITE PLAN |
| E2.0 | FIRST FLOOR PLAN ELECTRICAL DEMOLITION |
| E3.0 | FIRST FLOOR PLAN LIGHTING PLAN |
| E3.1 | FIRST FLOOR PLAN ELECTRICAL POWER PLAN |
| E3.2 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART |
| | PLAN |
| E3.3 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART |
| | PLAN |
| E3.4 | FIRST FLOOR PLAN ELECTRICAL FIRE ALARM PLAN |
| E3.5 | FIRST FLOOR PLAN ELECTRICAL SECURITY PLAN |
| E3.6 | ROOF ELECTRICAL PLAN |
| E3.7 | ROOF ELECTRICAL LIGHTING PROTECTION PLAN |
| T1.0 | TITLE SHEET |
| | |
| CIVIL | |

1.3 SCOPE

- A. Perform work and provide material and equipment as required for a complete and operational plumbing system as shown on the Drawings and as specified in this Section. Completely coordinate with work of other trades and provide for complete and fully functional installation.
- B. The work shall include, but is not limited to, the following major items of work:
 - 1. Sanitary, waste, and vent systems connecting to existing sanitary or vent lines within the building installed with all incidentals necessary for a complete operational system. The system shall include all piping, traps, flanges, seals, cleanouts, structural support (carriers, hangers), fixtures, floor drains, and such other standard accessories as are necessary for a complete approved system.
 - 2. Cold water system connecting each and every fixture, device, and item of equipment requiring cold water within the building and connecting to the existing water line in the space. The system shall be installed with all incidentals necessary for a complete operational system and shall include all piping, pressure reducing valves, insulation, valves, stops, hydrants, back flow preventers, vacuum breakers, gauges, structural support (hangers), water hammer arresters, and such other standard or specified accessories as are necessary for a complete approved system. This Contractor's work shall begin at ten feet outside the building extending the new domestic cold water main in the designated space.
 - 3. Hot water system connecting each and every fixture, device, and item of equipment requiring hot water within the building. The system shall be installed with all incidentals necessary for a complete operational system and shall include electric water heater(s), all piping, insulation, valves, stops, back flow preventers, vacuum breakers, gauges, thermostatic tempering/mixing valve(s), structural support (hangers, etc.), water hammer arresters, thermometers, and such other standard or specified accessories as are necessary for a complete approved system.
 - 4. Natural gas piping system connecting each and every fixture, device, and item of equipment requiring gas within the building from the gas regulator at the outdoor gas meter. The system shall be installed with all incidentals necessary for a complete operational system and shall include all piping, valves, stops, drips, meters, pressure reducing valves, gas regulators, gauges, structural support (hangers), and such other standard or specified accessories as are necessary for a complete approved system.
 - 5. Demolition of all existing aboveground and underground plumbing systems.
 - 6. Provide all plumbing fixtures and equipment as required by drawings and as specified.
 - 7. All rough plumbing and final connections to all items of equipment furnished by others requiring water, gas, drain, and waste connections. Furnish and install all traps with cleanouts and heavy-duty brass loose key angle valve supply stop kits.
 - 8. Furnish Access Panels for installation by others.
 - 9. The Plumbing Subcontractor shall be responsible for furnishing and installing all items in accordance with the Massachusetts Fuel Gas Code and Massachusetts State Plumbing Code.
 - 10. This Contractor shall be responsible for all seismic control for the entire plumbing piping system and equipment.
 - 11. Obtain all permits and approvals required for work under this Section.

3.

- C. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. SECTION GENERAL CONDITIONS OF THE CONTRACT.
 - a. Cutting, patching, and drilling, except installation of pipe supports and fastenings.
 - b. All patching.
 - 2. SECTION 310000 EARTHWORK
 - a. All excavation and backfill.
 - SECTION 03300 CAST IN PLACE CONCRETE.
 - a. All concrete work.
 - b. Trust blocks.
 - 4. SECTION 09901 PAINTING.
 - a. All painting.
 - 5. DIVISION 11 EQUIPMENT.
 - 6. SECTION 230000 HEATING, VENTILATING, AND AIR CONDITIONING.
 - 7. SECTION 260000 ELECTRICAL WORK.
- D. Extent: The work required under this Section, without limiting the generality thereof, includes the furnishing of all labor, materials, equipment, and services necessary for, and reasonably incidental to, the complete installation of all piping, valves, pumps, fixtures, insulation of piping, and all other materials, equipment, and labor necessary, whether or not such items are specifically indicated on the Drawings or in the Specifications, to complete the plumbing system in all respects ready for continuous and trouble free operation.
- E. Intent: It is the intent of the Contract Documents to include all work and materials necessary for erecting complete, ready for continuous use, all plumbing systems as shown on the accompanying Drawings or as hereinafter described. These Drawings shall be taken in a sense as diagrammatic; sizes of pipes and methods of running them are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that will be encountered during the installation of the work.

1.4 CODES, STANDARDS AND REFERENCES

- A. All materials and workmanship shall comply with the latest editions of all applicable Codes, Local and State Ordinances, Industry Standards and Regulations.
- B. The Plumbing Subcontractor shall notify the Architect/Engineer of any discrepancies between the Contract Documents and applicable Codes, Standards, etc.
- C. In the event of a conflict, the most stringent requirements shall apply.
- D. The following Codes, Standards and References shall be utilized as applicable:
 - 1. Massachusetts Uniform State Plumbing Code.
 - 2. Massachusetts State Building Code, 8th Edition.
 - 3. National Electric Code (NEC).
 - 4. Environmental Protection Agency (EPA).
 - 5. Commonwealth of Massachusetts Department of Environmental Protection (DEP).
 - 6. Local Ordinances, Regulations of City of Worcester.
 - 7. National Fire Protection Association (NFPA).
 - 8. Insurance Services Organization (ISO).

- 9. American National Standards Institute (ANSI).
- 10. American Society of Mechanical Engineers (ASME).
- 11. American Society for Testing and Materials (ASTM).
- 12. American Welding Society (AWS).
- 13. Commercial Standards, U.S. Department of Commerce (CS).
- 14. National Electrical Manufacturers Association (NEMA).
- 15. American Gas Association (AGA).
- 16. Underwriters' Laboratories, Inc. (UL).
- 17. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
- 18. Manufacturers Standardization Society of the Valve and Fitting Industry (MSS).
- 19. Architectural Access Board (AAB).
- 20. Americans with Disabilities Act (ADA).

1.5 COORDINATION

- A. Before starting work, visit site and examine conditions under which work shall be performed including preparatory work by others. Report conditions which might adversely affect the work in writing to the Architect. Do not proceed with the work until the defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as acceptance of preparatory work and existing conditions.
- B. Completely coordinate with work of other trades and provide for complete and fully functional installation. Although not specifically shown, provide supplementary or miscellaneous items, devices, appurtenances and materials incidental to or necessary for sound, secure and complete installation.
- C. This contractor is responsible for sleeving and coring all penetrations associated with the respective work. The General Contractor shall be responsible for firestopping all penetrations in accordance with section 07270 Firestopping. This contractor must fully coordinate with the G.C. so as to identify all the locations requiring firestopping.
- D. All piping and equipment running within trusses must be supported from top chord of truss at panel point. For any alternate configurations or for heavy pieces of equipment coordinate fully with structural engineer for support location before installation.

1.6 GUARANTEE

- A. Guarantee work performed under this Section in accordance with Division 1, General Requirements. Operation of systems or equipment for temporary services does not constitute beginning of guarantee period.
- B. The Contractor also agrees to furnish service of the equipment for the above period, such service to be rendered quickly and promptly at the request of the Owner. This shall not be misconstrued to include routine maintenance.
1.7 CONTRACT DOCUMENTS

- A. Plumbing drawings do not limit responsibility of determining full extent of work required by Contract Documents. Locations shown on drawings shall be checked against construction proper.
- B. Drawings are diagrammatic and indicate general arrangement of systems and work of this Contract.

1.8 DISCREPANCIES IN DOCUMENTS

- A. Where Drawings or Specifications indicate discrepancies or are unclear, advise Architect in writing before award of Contract. Otherwise, Architect's interpretation of documents shall be final and no additional compensation shall be permitted due to discrepancies or unclear items.
- 1.9 Where Drawings or Specifications do not coincide with recommendations of the manufacturer of a material or piece of equipment, this shall be brought to the attention of the Architect in writing before installation of item in question. Otherwise, make changes in installation, as Architect requires without additional cost to the Owner.
- 1.10 RECORD DRAWINGS
 - A. Maintain record drawings during construction in accordance with the General Conditions of the Contract.
- 1.11 PERMITS, FEES, RULES AND REGULATIONS
 - A. Refer to Bidding and Contracting Requirements, including Document 00700, GENERAL CONDITIONS and Documents 00800, SUPPLEMENTARY CONDITIONS, for requirements all of which shall be included as part of this Specification.
 - B. Give the proper Authorities all requisite notices or information relating to the work under this Section. Obtain and pay for all fees, licenses, permits and certificates. Comply with the rules and regulations of all Local, State and Federal Authorities having jurisdiction, the Codes, Standards, recommended practices and manuals of the National Fire Protection Association, I.S.O., and the Public Utilities Companies serving the building.

1.12 GAS SERVICE

A. This section shall expedite the Owner's application to NStar Gas for the gas service, meter and regulator for the space. The owner shall pay all gas company charges. The work of this section shall begins at the capped gas mains on the first and third floors. Regulator shall be set to provide sufficient gas pressure to the most pressure-demanding device. Note: Existing meter header with six meter sockets is installed already. Only one meter socket is currently in use.

1.13 SUBMITTALS

A. Refer to Section 01300, SUBMITTALS for submittal provisions and procedures.

- B. Submit six (6) copies of shop drawings and product data to Architect for approval. Any deviation from the Contract Documents, or proposed substitution of materials or equipment for those specified, must be requested by the Contractor in a separate letter, whether the deviations are due to field conditions, standard shop practices or other cause. Where any deviation or substitution is permitted, the Contractor shall fully coordinate all related changes to Architectural, Structural, Fire Protection, HVAC, Electrical or other work, and shall accomplish these related changes at no additional cost to the Owner. Refer to the general submittal requirements.
- C. Submit shop drawing or product data for the following:
 - 1. Plumbing fixtures, faucets, flush valves and accessories.
 - 2. Piping, valves and accessories.
 - 3. Floor drains, floor sinks, hose bibbs.
 - 4. Tankless gas fired water heater(s).
 - 5. Thermal Expansion Tank.
 - 6. Thermostatic water mixing valve(s) for all sinks.
 - 7. Pipe insulation.
 - 8. Pressure gauges and thermometers.
 - 9. Backflow preventers.
 - 10. Access Panels.
 - 11. Pipe identification labels.
 - 12. Do not release for shipment, deliver, or install any equipment or material without prior approval of the Architect-Engineer.

1.14 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: The Plumbing Subcontractor shall provide for the delivery of all his materials and fixtures to the building site when required so as to carry on his work efficiently and to avoid delaying his work and that of other trades.
- B. Storage and Handling: The Plumbing Subcontractor shall, at all times, fully protect his work and materials from injury or loss by others. Any injury or loss, which may occur, shall be made good without expense to the Owner. The Plumbing Subcontractor shall be responsible for the proper protection of all his materials until the building is accepted by the Owner.

1.15 CONTINUITY OF SERVICE AND SCHEDULING OF WORK

- A. Refer to the overall scheduling of the work of the project. Schedule work to conform to this schedule and install work to not delay nor interfere with the progress of the project.
- 1.16 CERTIFICATES OF APPROVAL
 - A. Upon completion of all work, furnish, in duplicate, certificates of inspection.
- 1.17 OPERATING AND MAINTENANCE INSTRUCTIONS
 - A. Prior to the final inspection, the Plumbing Contractor shall provide to the Architect three (3) sets of operating and maintenance instructions. The Architect shall review the instructions for completeness prior to turning them over to the Owner.

- B. Instructions: The Contractor shall provide qualified, factory-trained manufacturers' representative to give detailed instruction to assigned Owner personnel in the operation and complete maintenance for all equipment. All such training will be at the job site.
- C. Provide name, address, and telephone number of the manufacturer's representative and service company for each piece of equipment so that the source of replacement parts and service for each item of equipment can be readily obtainable.

1.18 SEISMIC RESTRAINTS

A. Installation of Plumbing equipment, accessories and components shall be in accordance with the Seismic Requirements identified in the Massachusetts State Building Code, Eighth (8th) Edition.

PART 2 - PRODUCTS

2.1 PRODUCTS CRITERIA

- A. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. See other specification sections for any exceptions.
- B. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
- C. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
- D. Asbestos products or equipment or materials containing asbestos shall not be used.

2.2 PLUMBING FIXTURES

- A. Provide plumbing fixtures as specified herein. Fixture trim, traps, faucet, escutcheons and waste pipes exposed to view in finished spaces shall be I.P.S. brass with polished chromium plating over nickel finish. Fixtures shall have manufacturer's label or trademark indication first quality. Insulate all exposed piping to handicapped lavatories and sinks with soft PVC coated insulation, Truebro Lav Guard model # 103 or equal.
- B. Mounting heights shall be as shown on architectural details.
- C. Each individual fixture shall be provided with supply stops for each water service.
- D. Fixture Schedule: Refer to drawings.

2.3 PIPE MATERIALS

- A. All soil, waste, and vent lines in accessible areas 2 in. and larger shall be cast-iron "no hub," ASA group 022 pipe and fittings joined with "Clamp-All," or equal; on pipe sizes 3 in. and larger, use four (4) band clamps, two (2) band clamps will only be allowed on 2 in. pipe. All buried soil, waste, vent, and storm lines shall be service weight cast-iron pipe with all fittings carefully fitted and caulked together with oakum and lead, sealed gas and watertight. Minimum size of piping below ground shall be 2 in. Where it is impractical to install cast-iron pipe, as in tight partition work or where the sizes of lines are smaller than 2 in., Type "L" copper tubing shall be used conforming to ASTM Specification with sweat type fitting using lead free solder and non corrosive flux, "Non Korrode," or approved equal, conforming to ASTM Specification B 32 alloy 50A. In lieu of oakum and lead joints, "push on type" resilient gasket fittings may be used on buried pipe only. Provide extra heavy cast-iron for urinal connections.
 - 1. Furnish and install hubless soil pipe couplings designated Heavy Weight (HW), made of extra wide, heavy duty corrugated type 304 stainless steel with axially slotted heavy duty, worm drive clamps tightened to 80 in lbs. of torque. Flanged gaskets to be made of neoprene rubber, meeting the requirements of ASTM C 564, with sealing rings under each stainless steel clamp. Manufacturers shall be Mission Heavy Weight, Husky 4000, Clamp-All 125, or equal.
- B. All vent lines 2 in. and smaller shall be Type "L" copper, or DWV, except minimum size below ground shall be 2 in. Minimum vent terminal through roof shall be 4 in. except otherwise noted. Vent flashing at the roof shall be by the Roofing Subcontractor.
- C. All cold and hot water piping within the building shall be hard copper Type "L" seamless drawn tubing assembled with sweat fittings. All solder used shall be lead free, cadmium free, "Silverbrite 100," or approved equal, complying with the latest issue of ANSI A 5.8 publication. All exposed runs to all toilet fixtures and sinks shall be chrome plated, including exposed piping in Kitchen.
 - 1. Mechanical grooved pipe couplings, fittings, Mechanical T's, and other products are acceptable to be used on piping systems and mechanical equipment connections 2-1/2"diameter and larger (in lieu of welded/flanged and threaded methods) in systems specified. Operating conditions not to exceed -30 F to 230 F temperature range according to the gasket lining selected and working pressures as shown in the coupling manufacturer's current product specifications.
 - 2. Press Fitting: Copper press fittings shall conform to the material and sizing requirements of ASME B16.18 or ASME B16.22. O-Rings for copper press fittings shall be EPDM.
 - a. Manufacturers of Copper Press Fittings:
 - 3. Viega, 17545 Daleview Dr., Lakewood, OH 44107, (877) 620-0016 or Rigid Tool Company, 400 Clark Street, Elyria, OH 44035, (800) 519-3456
- D. Solder Standard: Solder metal shall conform to the requirements of ASTM B32. Soldering fluxes shall conform to ASTM B813. Solder and fluxes used in drinking water systems shall have a maximum of 0.20-percent lead (Pb) content.
- E. Cold water pipe below ground: Type K soft copper tubing with flared fittings.

- F. Indirect waste piping less than 1-1/4" in size shall be Type "L" hard drawn copper tubing with wrought copper sweat fittings joined with approved 95/5 lead free tin antimony solder.
- G. Indirect waste piping 1-1/4" and larger in size shall be Type DWV hard drawn seamless copper tubing with wrought copper drainage fittings joined with approved 95/5 lead free tin antimony solder.
 - 1. All natural gas piping inside the building shall be Schedule 40 black steel pipe with malleable pattern fittings, installed in strict compliance with the Massachusetts Fuel Gas Code, (248 CMR 5.00). All piping 2 in. and below shall be assembled with screwed malleable iron fittings; 2-1/2 in. and above shall be welded. Provide necessary ball type gas shut-off valves or square head cocks and drips as required. All joints shall be made up with "Rectoseal" and tested.
 - 2. All welding shall be done in accordance with the welding procedures of the National Certified Pipe Welding Bureau, or any other approved procedure, conforming to the requirements of the ASA Code for Pressure Piping. No welder shall be employed on the work that has not been fully qualified under the above-specified procedure and so certified as a member of the local chapter of the National Certified Pipe Welding Bureau or similar locally recognized testing authority.
 - 3. The Plumbing Subcontractor shall apply for the new natural gas service and the Owner shall pay for all fees and charges required. On-site service entrance piping shall be by NStar Gas Company, including all gas pressure regulators.
 - 4. Apply two coats of rustproof primer to all gas piping exposed to weather. One coat of primer shall be applied to all other gas piping.

2.4 VALVES

- A. Gate Valves:
 - 1. Valves 3 in. and smaller, where indicated on the Drawings, shall be Class 125, body and bonnets shall be of ASTM B 62 cast bronze composition, solid disc, copper silicon alloy stem, brass packing gland, Teflon packing, and malleable handwheel, solder end, Stockham Figure B 110, or approved equal.
 - 2. Valves shall be as manufactured by Stockham, Jenkins, Hammond, or approved equal.
- B. Ball Valves:
 - 1. On water lines inside the building, ball valves 3 in. and smaller shall be as manufactured by Consolidated Valve Industries, Inc.'s "Apollo" 95-200-03 Series stop and drain with 1-1/4 in. extended stems for piping 1/2 in. to 1 in. size; 77-100/200 Series with 1-1/4 in. extended stems for piping 1-1/4 in. to 3 in. size. Valves shall be provided with stainless steel ball, reinforced Teflon seats and seals, bronze body, 400-PSI WOG, positive 100 percent shutoff, full port design. Valves 4 in. in size shall be equal to "Apollo" 82-24A with extended stem.
 - 2. Drain valves at all low points shall be "Apollo" 78 100 or 78 200 Series, 1/2 in. or 3/4 in. solder by 3/4 in. hose end with attached cap and chain.
 - 3. Valves on gas lines shall be UL listed, 250-PSI LP gas rated, "Apollo" Model 80-100-YRPV Series with tee or lever handle, as approved by the Massachusetts Fuel Gas Code. Where indicated on the Drawings, for Classroom zone shutoffs, ball valves shall be enclosed in a recessed valve box, as hereinafter specified.
 - 4. Ball valves shall be of one (1) manufacturer, Conbraco Industries, Inc., "Apollo," Watts Regulator, Nibco/Scott, or approved equal.

- C. Check Valves:
 - 1. Check valves shall be furnished and installed where indicated on the Drawings. Checks up to 3 in. shall be Class 125, solder ends, body and caps shall be ASTM B 62 cast bronze composition, swing type disc, Stockham Figure B 309.
 - 2. Check valves 4 in. and larger shall be iron body, bronze mounted with body and cap conforming to ASTM A 126 Class B cast-iron, flanged, swing type disc, Stockham Figure G 931.
 - 3. Check valves shall be as manufactured by Stockham, Jenkins, Milwaukee, or approved equal.
- D. Plug Valves: Furnish and install cast-iron plug valves on all natural gas piping 2 in. and larger, with flanged ends, Model 133 as manufactured by Serek Audco, with 100 percent free area, rated at 125 PSI working pressure, or approved equal.
- E. Strainers: Strainers shall be iron body 'Y' type with bronze strainers, 250-PSIG steam and 400 W.O.G. Provide ball valve with hose bib for blow down similar to Watts # B-6000-CC.
- F. Expansion Tanks: Expansion tanks shall be Taco #PAX series for domestic hot water application. The domestic water heater system shall have a Taco #PAX130 expansion tank with 34 gallons tank volume and 19 gallon acceptance volume.

2.5 TRAPS

- A. Provide separate traps with integral cleanouts on fixtures and equipment requiring connections to sanitary system. Exceptions are fixtures with integral traps. Traps exposed to view, including connecting drain lines, shall be chrome plated. No trap shall be less than 1-1/2 inch and shall be sized as required by Code.
- B. Traps shall be service weight cast-iron where buried in floors or serving floor drains with trap primer connections where noted on the Drawings. Where traps are not connected directly under the drain they serve in the floor, they shall be fitted with top cleanouts and extensions to the floor with access covers and plates.
- C. Furnish and install traps as required for all items of equipment furnished under other Sections of these Specifications, and/or by the Owner.

2.6 INSULATION

A. All hot water and cold-water piping shall be insulated with Manville FLAME SAFE fiberglass pipe insulation, Owens Corning Fiberglass 25, or approved equal. The insulation shall have an average thermal conductivity not to exceed .25 BTU in. per sq. ft. per F. per hour at a mean temperature of 75 degrees F. Thickness of the insulation shall be 1/2 in. for cold water piping up to and including 2 in., 1 in. thick for cold water piping 2 1/2 in. and above, and 1 in. for hot water and hot water recirculating piping. Jacket shall be FLAME SAFE AP. The insulation shall be applied over clean dry pipe with all joints butted firmly together. Longitudinal jacket laps and the butt strips shall be smoothly secured with Benjamin Foster 85 20 adhesive.

- B. All fittings and valves shall be insulated with the proper factory pre-cut fiberglass insulation and covered using the factory, pre-molded, one-piece PVC fitting covers secured with flexible off-white 10 mil polyvinyl chloride film bonded with a specially formulated adhesive that can be installed indoors and out with a strong permanent bond conforming to MIL Spec. No. 7798-A.
- C. All exposed supply and waste piping to handicapped lavatories or sinks shall be insulated with Truebro Model 101W or 102W "Handi-Lav-Guard" trap and hot water insulation kits with accessory no. 105.
- D. All exposed insulated piping, in public areas and storage areas, 10 ft. 0 in. up from finish floor shall be provided with an additional jacket made of high impact polyvinyl chloride 10 mil thickness, applied over herein before specified insulation, using vapor barrier mastic adhesive.
- E. Insulation shall be Manville, Owens Corning, CertainTeed Corp., Armstrong, or approved equal.

2.7 PIPE SLEEVES, HANGERS AND SUPPORTS

- A. Pipe sleeves, pipe hangers, pipe anchors, auxiliary steel, fire treated wood blocking and fixture supports shall be furnished and set by this Contractor, and he shall be responsible for the proper and permanent location. This Contractor shall be responsible for all core drilling.
- B. Pipe sleeves shall be installed and properly secured at all points where pipes pass though masonry, concrete or wood. Pipe sleeves shall be of sufficient diameter to provide approximately ¼" clearance around insulation. Pipe sleeves through masonry partitions and floors shall be Schedule 40 galvanized steel pipe. Wall sleeves shall have chromium-plated escutcheons with setscrews or clips for firmly holding in place. Sleeves through wall shall end flush with surface of walls. Sleeves in floors shall extend 1" above the floor and after installation of piping shall be packed and made watertight. Provide core drilling. Core openings shall have Link-Seal fire rated penetration closures. Sleeves in exterior walls shall have water stop plates, shall end flush with the surface of the walls and shall have Link-Seal penetration closures.
- C. Where pipes penetrate fire rated floors and partitions, the openings shall be packed with material which wall maintain the integrity of the fire rating.
- D. All piping shall be rigidly supported from the building structure by means of approved hangers and supports. This Contractor shall furnish and install all required auxiliary steel required for hanging of piping
- E. All horizontal piping shall be hung with approved adjustable malleable iron pipe hangers. Cast iron soil pipe shall be supported at 5' intervals except where 10' lengths of piping are used, then 10' intervals are acceptable. Supports shall be placed directly beneath horizontal fittings that connect to the stack. Copper tubing 1-1/2" and larger shall be supported at 10' intervals. Copper tubing 1-1/4" and smaller shall be supported at 6' intervals. Steel piping shall be supported at 6' intervals for piping1/2" and smaller, at 8' intervals for ³/₄" and 1" piping and at 10' intervals for piping 1-1/4" and larger.

- F. Vertical cast iron piping shall be supported at base, at each story height and at 10' intervals. Vertical steel piping and copper tubing shall be supported at each story height and at no more than 10' intervals.
- Hangers for piping sizes 4" and smaller shall be Carpenter & Paterson, No. 1A band type, G. Grinnell Company, Calco Steel Products Company or equal, black steel with hanger rods with machine threads; for uninsulated copper tubing, the hangers shall be copper plated. Hangers for piping larger than 4" shall be the adjustable clevis hanger type, malleable iron and extension rod. Chain, strap, perforated bar or wire hangers will not be approved. Approved gang hangers may be used in lieu of separate hangers on pipes running parallel to each other and close together. Where used for uninsulated copper tubing, all hangers shall be copper plated. Insulation shields shall be provided on all horizontal insulated piping at each hanger or supported location. Insulation shields shall be galvanized steel, 180 degrees arc and centered in the hanger or support. On diameters 4" and smaller, shield shall be 12" long, 18 gauge steel. On diameters 5" and 6", shield shall be 18" long, 16 gauge steel. On diameters 8" and 10", shield shall be 24" long, 14 gauge steel. On diameters greater than 10", shield shall 24" long 12-gauge steel. This Contractor shall furnish and install steel insulation shields at each hanger location on piping to be installed. Structure attachments shall be as manufactured by Carpenter & Patterson and shall be suitable to carry the weight. Pipe alignment guides shall be split-sleeve type as manufactured by Broat Manufacturing, Inc. and suitable for copper tubing.
- H. All fixtures and equipment shall be supported and fastened in a satisfactory manner and in accordance with fixture manufacturer's recommendations.
- I. Wherever fire treated wood blocking is required to insure adequate support of fixtures and related piping, it shall be provided by this Contractor.

2.8 CLEANOUTS

- A. Cleanouts shall be provided in soil and waste pipes at changes in direction, where shown on Drawings, and at other points required by Code so that lines will be readily accessible for cleaning or rodding out; provide a minimum of 24 inch clearance for rodding. Cleanouts shall be same size as pipe in which they are installed but not larger than four inches.
- B. Cleanouts shall be installed so that cleanout opens in direction of flow of drainage line served or at right angles thereto. Cleanout plug shall be kept free of dirt and construction materials and shall not be covered with cement, plaster or other permanent finishing materials.
- C. Floor cleanouts shall have cast iron body and frame with square adjustable scoriated secured nickel bronze top. Unit shall be vertically adjustable for a minimum of two inches. When waterproofing membrane is used, provide clamping collar. Cleanouts shall consist of "Y" fittings and 1/8 inch bends with brass or bronze screw plugs. Cleanouts in tile floors shall have Square top covers recessed for tile insertion; in carpeted areas, provide carpet cleanout markers. Floor cleanout shall be Zurn 1400 Series Level trol Supreme cleanouts and Type ZN 1400-Z in terrazzo floors, Type ZN-1400-X in tiled floors, Type ZN-1400-CM in carpeted floors, and Type ZN-1400-2 in all other locations. Cleanouts shall be set flush and level with top of finished floor surface except in carpeted areas where they shall be flush with concrete.

- D. Provide cleanouts a base of vertical stacks with cleanout plug located approximately 30 inches above floor. Extend cleanouts to wall with access covers. Cleanout shall consist of sanitary tees. Furnish nickel-bronze square frame and cover with minimum opening 6 x 6 inches at each wall cleanout.
- E. In horizontal runs above grade, cleanouts shall consist of cast brass screw plug in fitting or in caulked cast iron ferrule.
- F. Wall cleanouts shall be brass, recessed head plugs with Zurn ZN 1441 with round cover.

2.9 ACCESS PANELS

- A. Furnish access panels for access to all parts of the plumbing systems that require accessibility for the proper operation and maintenance of the system.
- B. Size shall be sufficient for the purpose, but no less than 12 inches by 18 inches. Particular attention shall be exercised in the selection of doors for masonry walls in order that frame sizes used will match the courses of brick or block.
- C. Access doors shall be prime coated of rust inhibitive paint, continuous hinge and manufactured by Inland Steel Products Company "Milcor", Miami-Carey, Mifab or Walsh-Hannon-Galdwin, Incorporated "Way Loctor". Type shall be based upon "Milcor" as follows:
 - 1. Suspended Drywall Ceilings: Style ATR with 16-gauge frame, 18-gauge panel and flush screwdriver operated cam locks.
 - 2. Plastered Walls and Ceilings: Style K with 16-gauge frame, 14-gauge panel and flush screwdriver operated cam locks.
 - 3. Masonry Non-Rated Walls: Style M with 16-gauge frame, 14-gauge panel and flush screwdriver operated cam locks.
 - 4. Masonry Non-Rated Wall: Fire rated with UL 1-1/2 hour "B" rating, 16 gauge frame, 20 gauge sandwich type insulated panel, self-latching lock having interior release mechanism, and key operated cylinder lock keyed as required to suit requirements of the Architect.
 - 5. Non-Rated Dry Walls: Style DW with 16-gauge frame, 14-gauge panel screwdriver operated cam locks.

2.10 JOINTING COMPOUNDS

A. Provide pipe dope, Teflon tape, wax rings, neoprene gaskets and other jointing compounds as required by best standard practice and only on service as recommended by the manufacturer. Work shall conform to manufacturer's recommendations with regard to use of putties, jointing compounds or both in installing plumbing fixtures and trim.

2.11 FLOOR DRAINS

A. A.Provide floor drains of the type specified hereinafter; drains shall be Josam, Zurn, Jay R. Smith or equal. Provide suitable clamping device and extensions if required, where installed in connection with waterproofing membrane.

2.12 WATER HAMMER ARRESTORS

- A. Maintenance free water hammer arrestors shall be furnished and installed at all locations in the water systems where quick acting valves are installed as well as wherever water hammer may occur. Examples of such locations are as follows:
 - 1. Flushometer valves.
 - 2. Self-closing and metering faucets.
 - 3. Dishwashing machines.
 - 4. Hose spray pre-rinse.
- B. Water hammer arrestors shall be as manufactured by Josam Manufacturing Company, J.R. Smith Manufacturing Company, Zurn Systems or Precision Plumbing Products, Inc. Arrestors shall be installed at each and every multiple of fixtures or items as listed above, water hammer arrestors may serve groups of fixtures. Sizing and placement shall be in accordance with PDI Standard PDI-WH-201 and the manufacturer's recommendations. Provide access panels.
- C. Water hammer arrestors shall be as follows:

| Туре | Fixture Unit Rating | Model | |
|-----------|---------------------|-------------------|--|
| 1. SA "A" | 1-11 | Jay R. Smith 5005 | |
| 2. SA "B" | 12-32 | Jay R. Smith 5010 | |
| 3. SA "C" | 33-60 | Jay R. Smith 5020 | |

2.13 TRAP PRIMERS

A. Provide trap primer station(s) for all floor drains.

2.14 THERMOMETERS AND PRESSURE GUAGES

- A. Straight Thermometers:
 - 1. Where indicated on the Drawings, furnish and install 7 in. long die-cast aluminum case, "Adjustable Angle" red appearing mercury tubing thermometers, H.O. Trerice Co., Cat. A001 complete with separable stainless steel Type 304 socket, 30 degrees to 240 degrees F. range, and lagging extensions when installed in insulated pipe.
 - 2. Thermometers to be adjusted to a position for maximum readability from normal operator's position.
 - 3. Thermometers shall be H.O. Trerice Co., Weksler Instruments Corp., Weiss Instruments, or approved equal.
- B. Dial Thermometers:
 - 1. Dial thermometers, where indicated on the Drawings, shall be of the Bi Metal actuated design with overtemperature and low temperature protection, with aluminum, hermetically sealed case, non removable gasketed ring, 5 in. dished dial size, stainless steel stem with stainless steel thread connection, accuracy 1 percent at mid range, 2 percent at side ends, fixed 1/2 in. NPT with 3/4 in. NPT brass well, dial

shall have adjustability to be rotated 360 degrees and the stem turned 180 degrees for readability, range 0 degrees to 240 degrees F. and with 4 in. stem lengths.

- 2. All thermometers shall be installed at an angle easily readable from the floor. All thermometers shall have brass separable sockets with casings.
- C. Pressure Gauges: Pressure gauges shall be as manufactured by Trerice, or approved equal, Series 600, 4-1/2 in. diameter, range 0 to 200 PSI, aluminum case, white face with black figures, with petcocks.
- 2.15 TANKLESS WATER HEATERS (HWH-1 & 2)
 - A. Refer to drawing schedules.
- 2.16 PIPE IDENTIFICATION AND VALVE TAGS
 - A. All piping, except that piping which is within inaccessible chases, shall be identified with semi-rigid plastic identification markers equal to Seton or approved equal Setmark pipe markers. Directions of flow arrows are to be included on each marker. Each marker background shall be appropriately color coded with clearly printed legend to identify the contents of the pipe in conformance with the "Scheme for the Identification of Piping Systems" (ANSI 13.1-1981). Setmark snap-around markers shall be used above six inch overall diameters up to six inches and strap-around markers shall be used above six inch overall diameters. Markers shall be located adjacent to each valve, at each branch, at each cap for future, at each riser take off, at each passage through wall, at each pipe passage to underground and on vertical and horizontal piping at 20 foot intervals maximum. All non-portable water lines and outlets shall be identified in accordance with the requirements of the Massachusetts Uniform State Plumbing Code.
 - B. All valves shall be designated by distinguishing numbers and letters carefully coordinated with a valve chart. Valve tags shall be 19 gauge polished brass, 1-1/2 inch diameter with stamped black filled letters similar to Seton S type 250-BL or approved equal. Lettering shall be 1/4 inch high for type service and 1/2 inch for valve number. Tag shall be attached to valves with approved brass "S" hooks, or brass jack chin. Whenever a valve is above a hung ceiling, the valve tag shall be located immediately above the hung ceiling.
 - C. Furnish a minimum of two typed valve lists to be framed under glass or plexi-glass. Each chart shall be enclosed in an approved .015-inch thick plastic closure for permanent protection. Valve numbers shall correspond to those indicated on the Record Drawings and on the printed valves lists. The printed list shall include the valve number, location and purpose of each valve. It shall state other necessary information such as the required opening or closing of another valve is to be opened of closed. Printed framed valve lists shall be displayed in each Mechanical Room or in location designated by the Owner.
 - D. Equipment nameplates shall be 3/4 inch by 2-1/2 inch long .02-inch aluminum with a black enamel background with engraved natural aluminum letters similar to Seton Style 2065-20. Nameplate shall have pressure sensitive taped backing.
 - E. Provide a brass will plaque, minimum .020-inch thickness, secured to the exterior wall just above the grade line for all buried serviced entrances or exits. Samples of such are: Water Service Below; Sanity Sewer Below; Kitchen Waste Below; Storm Drain Below; etc.

PART 3 - EXECUTION

3.1 SPECIAL RESPONSIBILITIES

- A. Cooperate and coordinate with other trades in executing work of this Section. Perform work such that progress of entire project including work of other trades shall not be interfered with or delayed. Provide information on items furnished under this Section to be installed by other Sections.
 - 1. Obtain detailed information from manufacturers of equipment as to proper method of installation. Give full information so that openings required for work of this Section might be coordinated with other work and other openings and many be provided for in advance. In case of failure to provide information, cutting and patching will be done at the expense of this Section to the satisfaction of the Architect.
 - 2. Notify Architect of location and extent of existing piping and equipment not shown on the Drawings, which interferes with new construction. With approval of Architect, relocate existing equipment to permit new work to be installed as required by Contract Documents. With approval of Architect, remove non-functioning or abandoned piping and equipment.
- B. During progress of work, remove and properly dispose of resultant dirt and debris and keep premises reasonably clean. Upon completion of work, remove equipment and unused material provided for work.
- C. Conduct work so as not to interfere with functioning of existing sewer, water and gas mains. Extreme care shall be observed to prevent debris from entering piping. Confer with Architect as to disruption of water service or their utilities due to testing or connection of new work to existing.
- D. All piping and equipment running within trusses must be supported from top chord of truss at panel point. For any alternate configurations or for heavy pieces of equipment coordinate fully with structural engineer for support location before installation.

3.2 MATERIALS AND WORKMANSHIP

- A. Work shall be executed in a workmanlike manner and shall present neat appearance when completed. Piping shall rum concealed except in mechanical rooms and areas where no hung ceiling exists. Material and equipment shall be installed according to manufacturer's recommended best practice.
- B. Materials and equipment shall be new, unless otherwise noted.

3.3 ESCUTCHEONS

A. Escutcheons shall be installed around exposed pipe passing through finished floor, wall or ceiling. Escutcheons shall be heavy cast brass, chrome-plated, adjustable, of sufficient outside diameter to cover sleeve opening and to fit snugly around pipe or insulation.

3.4 SLEEVES AND INSERTS

- A. Sleeves for piping between floors and through firewalls or smoke partitions shall be installed with approved packing between sleeves and piping to provide firestop. Coordinate with G.C. requirements.
- B. This contractor is responsible for sleeving all pipe penetrations before pouring of slab. If additional holes are required this contractor shall core drill such holes in coordination with the general contractor and with prior consent of the Architect.

3.5 INTERIOR WATER SUPPLY SYSTEM

- A. Water supply piping shall be run as indicated on the Drawings, including new connections to mains and supplies to fixtures. Connections to fixtures shall be from top of mains and piping shall be pitched at least 1 inch in 40 feet in the direction of flow so that it can be drained completely at low points. Provide drain valves where necessary. Piping shall be pitched up towards fixtures for proper air relief.
- B. Provide water hammer arrestors of proper size and type at end of each water branch with flush valves as shown on the drawings.
- C. Provide ball type shut-off valves on water branches to individual areas and to each bathroom group and kitchen. Ball valve shut offs shall also be provided at the dishwasher and steam generation equipment.

3.6 SANITARY, WASTE AND VENT PIPING

A. Interior horizontal sanitary and waste piping shall be installed in practical alignment at uniform grade of 1/8 inch per foot minimum up to1/4 inch per foot if possible or if required by code such as for waste piping smaller than 4". Coordinate invert of tie-ins to site piping with site contractor. Piping within building shall be coordinated closely with the work of other trades, in particular the HVAC ductwork.

3.7 VENTS THROUGH ROOF

- A. All vents extending through the roof, which serve the sanitary and waste systems shall extend no less than 18" and no more than 24" above the roof. Where roofs are used for gardens, sun decks or similar purposes, the vent shall extend at least 8 feet above the roof and be increased one pipe size. Offset all vents requiring same in order to avoid interference with HVAC units, to facilitate flashing conditions as well as maintain minimum required distance from all natural and mechanical fresh air inlets.
- B. No vent terminal shall be located directly beneath any door, window, or other ventilating opening of the building or of an adjacent building, nor shall any vent terminal be within 10 feet horizontally of such an opening unless it is at least 2 feet above the top of such opening.
- C. Vent terminals shall be located at least 25 feet horizontally from all fresh air intakes.

3.8 ELECTRICAL ROOMS

A. Piping shall not be installed in or through Electrical Rooms, Electrical Closets, unless the piping is intended to serve these rooms. No piping shall be installed over electrical panels.

3.9 CLEANOUTS

A. All cleanouts shall be set flush with walls or floors. Finish shall be protected during construction with proper covering. Flush floor cleanouts shall be coordinated so as to not be located beneath any partitions, casework nor beneath any non-potable equipment.

3.10 VALVES

- A. All valves shall be furnished and installed under this Section shall be located in a manner to allow proper access for service and repair.
- B. In no case shall valve stem and handle on a gate or globe valve be installed below the centerline of the pipe it serves.

C. Valves

3.

- 1. Provide valves, check valves, balancing cocks and lubricated plug as noted and as indicated on drawings.
- 2. Shutoff Valves
 - a. Inlets
 - b. All branch connections to mains.
 - c. As noted.
 - Check Valves
 - a. Other Locations: Types as noted.
- 4. Valves
 - a. Accessible, but no valves handles pointing down below horizontal position. Removable without separating or lifting piping in which valves are installed. Provide cap screws on threaded bodies. Where abutting flanged strainers or similar devices, position valve with respect to device so as permit removal of bolts.
- 5. Drain valves at low points in water piping and where noted.
 - a. In equipment rooms.
 - b. Use $\frac{1}{2}$ " NIBCO T-585-70-HC or equal drain valve with capped hose connection except in equipment rooms.
- 6. Manual air vents at high points and where required to expel air.
 - a. Up to 3" pipe.
 - 1) Line size air chamber, $12^{"}$ long, $\frac{1}{2}^{"}$ gate valve.
- 7. Where possible install gate, globe and ball valves with stems upright and not more than 15° off of vertical, not inverted.
- 8. Where possible install butterfly valves with stems in horizontal position and with the low point of disc opening with the direction of flow.
- 9. Provide stem extensions on all valves such that hand wheel or lever extends beyond insulation and is operable.
- 10. Ball valves (line sizes through 2") may be used interchangeably with gate valves for shut-off and isolating service in all water systems. Note soft seated butterfly valves

can only be used in water below 150 F and all butterfly valves in water services above 150 F shall be of the high performance type.

- 11. Provide spring loaded silent type check valves on discharge of pumps.
- 12. Install swing check valves in horizontal position only.
- 13. Provide drain valves at low points between valves, low points of piping system and at equipment.
- 14. No butterfly valves shall be used in steam systems.
- 15. Threaded valves shall be provided with a union adjacent to and downstream of valve.
- 16. Butterfly valves shall not be used for balancing.
- 17. Butterfly valves shall be installed between weld neck flanges only.

3.11 FLOOR DRAINS

A. Floor drains shall be furnished and installed by this contractor; he shall be responsible for correctly setting these drains to the proper grade to assure proper drainage from all surrounding areas. Sizes of drains shall be the same size as the pipe it serves.

3.12 JOINTS AND CONNECTIONS

- A. Joints and connections of piping shall be made permanently gas and water tight.
- B. Dielectric couplings or unions shall be used where dissimilar piping materials are joined.
- C. Final plumbing and gas connections to all equipment furnished or installed by others shall be by this Section.

3.13 INSULATION

- A. Insulation shall be applied over clean dry pipe with all joints butted firmly together and sealed with butt strips. Insulation shall run through all hangers and sleeves and have an 18 gauge sheet metal saddle equal to three (3) times the pipe diameter in length, on all pipes over 2 in. in diameter.
- B. All fittings, valves, and exposed supply and waste piping to the handicapped lavatories, etc., shall be insulated as specified. The ends of the insulation shall be tucked snugly into the throat of the fitting and the edge adjacent to the pipe covering tufted and tucked in fully insulating the pipe fitting. The one piece PVC fitting cover shall then be secured by taping the ends to the adjacent covering.
- C. In addition to the regular insulation specified, all exposed piping from floor up to 10 ft. 0 in. shall have a PVC jacket cover applied over the insulation from finish to 10 ft. 0 in. above. All joints shall be sealed with tape.

3.14 FIXTURES

A. Fixtures shall be the best product of the manufacturer, shall be without defects in construction or Appearance, shall be set true and level, and shall be firmly supported in place without rocking or strain. Fixtures shall be adjusted for proper operation and shall be tested in the presence of the Architect Engineer. All fixtures shall be thoroughly cleaned and all labels, stickers, and dirt marks **shall** be removed.

B. The installation of all backing for plumbing fixtures and their accessories not affecting the structure shall be the work of the Plumbing Subcontractor. Cutting and chasing which does not affect the structure shall also be the work of the Plumbing Subcontractor. All cutting and chasing, and installation of all backing for fixtures and accessories, which affects the structure, shall be the work of the Carpenters and/or General Contractor.

3.15 ADJUSTMENT

- A. Adjust all flush valves, pressure reducing valves, meter faucets, and water temperature controllers, water heater, and recirculation pumps for proper outlet temperatures and pressure.
- B. The Plumbing Subcontractor shall be responsible for adjusting and balancing the entire domestic hot water recirculation system. Provide recirculation pump balance report.

3.16 INSTALLATION OF EQUIPMENT

- A. Install equipment to avoid interference with structure and work of other Sections, preserve adequate headroom and clear doors and passageways, to satisfaction of Architect, and in accordance with Code requirements. Installation shall permit clearance for access to equipment for repair, servicing and replacement.
- B. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the equipment being installed, printed copies of these recommendations shall be furnished to the Architect prior to installation.
- C. All equipment running within trusses must be supported from top chord of truss at panel point. For any alternate configurations or for heavy pieces of equipment coordinate fully with structural engineer for support location before installation.

3.17 ACCESS PANELS

A. Furnish and deliver access panels for access to all concealed parts of the Plumbing System that require accessibility for the proper operation and maintenance of the system. Access panels shall be installed by others.

3.18 DISINFECTION

A. The domestic water distribution piping system shall be thoroughly disinfected with solution containing not less than 50 parts per million of available chlorine. Solution shall be introduced into system for period of eight hours, during which time valves and faucets shall be opened and closed several times. After disinfection, solution shall be flushed from system with clean water until residual chlorine content is not greater than 0.2 parts per million.

3.19 CLEANING

A. Upon completion of work but prior to final system testing, all parts of installation shall be thoroughly cleaned. Fixtures, pipe, valves and fittings shall be completely cleaned of

grease, metal cuttings, dirt, etc. Protective covers shall be removed and fixtures shall be cleaned and ready for use.

3.20 TESTING

- A. Provide testing of plumbing systems as required by authorities having jurisdiction, including Owner and Architect. Tests shall be conducted as part of work of this Section and shall include labor, equipment, apparatus and services required to perform tests.
- B. Prior to final acceptance, furnish Architect with certificates of testing and inspection for plumbing systems indicating approval of authorities having jurisdiction and conformance with requirements of Contract Documents.
- C. Notify Architect and authorities involved at least 48 hours prior to testing and inspection. Do not paint, cover or conceal work prior to testing, inspecting and obtaining approval.
- D. Provide temporary piping and connections for testing, flushing or draining systems to be tested. Leaks, damage or defects discovered or resulting from test shall be repaired or replaced to like-new condition. Piping must be absolutely tight before it will be accepted and joints shall be made tight without caulking.
- E. Tests for Plumbing Systems: Soil, waste, vent, gas, and water piping shall be tested by the Plumbing Subcontractor and approved before acceptance. Underground soil, rain conductor, and waste piping shall be tested prior to backfilling. Equipment required for tests shall be furnished by the Plumbing Subcontractor at no additional cost to the Owner. All tests shall be witnessed and approved by the Plumbing Inspector.
- F. Drainage And Venting System Piping: All vent, soil, waste, acid waste, acid vent, and rain conductor shall be tested with water or air before the fixtures are installed.
 - 1. Water Test: Water test shall be applied to the drainage and venting system in their entirety or in sections. If the entire system is tested, all openings in the pipe shall be tightly closed, except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening, except the highest opening of the section under test, shall be tightly plugged and each section shall be filled with water and tested with at least a 10 ft. head of water. In testing successive sections, at least the upper 10 ft. of the next preceding section shall be tested so that each joint of pipe in the building, except the uppermost 10 ft. of the system, has been submitted to a test of at least 10 ft. head of water. The water shall be kept in the system, or in the portion under test, for at least two (2) hours before the inspection starts. The system shall be tight at all joints.
 - 2. Air Test: If tests are made with air, a pressure of not less than 5 lbs. per sq. in. shall be applied with a force pump and maintained at least one (1) hour without leakage.
- G. Water System: When the roughing in is complete, and before fixtures are set, the entire hot water recirculation and cold water piping system shall be tested at a hydrostatic pressure of not less than 125 PSI gauge and proved tight at this pressure for not less than four (4) hours in order to permit inspection of all joints. Where a portion of the water piping system is to be concealed before completion, this portion shall be tested separately as specified for the entire system. All water entrance piping up to PRV-station shall be tested at 50 PSI in excess of the street pressure, but not to exceed 200 PSI.

- H. Gas System: Gas system shall be tested with air at a pressure of 100 lbs. per sq. in. and maintained at least one (1) hour without leakage.
- I. Defective Work: If inspection or test indicates defects, such defective work or material shall be replaced or repaired as necessary and inspection and tests repeated. Repairs to piping shall be made with new materials. No caulking of screwed joints or holes will be acceptable.

3.21 LUBRICATION

A. After complete installation by the Contractor of any equipment which depends on lubrication for efficient operation, the Contractor shall properly lubricate per instructions of the manufacturer. This shall be done before any test runs or final operation.

END OF SECTION 220000

SECTION 230000 – HEATING, VENTILATION & AIR CONDITIONING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- 1.2 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:
 - A. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors". The following shall appear on the upper left hand of the envelope:

Name of Sub-Bidder:Print Name of Sub-bidderProject:REGIONAL EMERGENCY COMMUNICATIONS CENTERSub-Bid for Section:230000 – HEATING, VENTILATION, AIR CONDITIONING

- B. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 in person, or by written request.
- C. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.
- D. Additional Requirements:
 - 1. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:
 - 2. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that subsubtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such

class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

3.

| Class of Work | Reference Specification | Paragraphs | |
|---------------|-------------------------|------------|--|
| | | | |
| | | | |
| | | | |

E. The work done by this sub-bidder is shown on the following drawings:

| T1.0 | TITLE SHEET |
|---------------|--|
| | |
| CIVIL | |
| C1 | EXISTING CONDITIONS |
| C2 | DEMOLITION PLAN |
| C3 | EROSION AND SEDIMENT CONTROL |
| C4.1 | SITE PLAN (BASE BID) |
| C4.2 | SITE PLAN (ALTERNATES) |
| C5 | DRAINAGE AND UTILITIES |
| C6 | DETAILS |
| | |
| ARCHITECTURAL | |
| D1.0 | DEMOLITION PLAN-EXISTING PLAN & ELEVATIONS |
| A1.0 | EXISTING FOUNDATION WORK PLAN & DETAILS |
| A1.1 | |
| A1.2 | FIRST FLOOR PLAN - ENLARGED |
| A1.3 | ROOF PLAN & DETAILS |
| A1.4 | COVERED TRAILER STORAGE |
| A2.1 | ELEVATIONS |
| A3.1 | BUILDING SECTIONS |
| A4.1 | WALL SECTIONS |
| A4.2 | WALL SECTIONS |
| A5.1 | SECTION DETAILS |
| A6.1 | INTERIOR ELEVATIONS |
| A6.2 | INTERIOR ELEVATIONS |
| A6.3 | INTERIOR ELEVATIONS |
| A7.1 | REFLECTED CEILING PLANS |
| A8.1 | SCHEDULES & DETAILS |
| | |
| FIRE | |

| PROTECTION | | |
|------------|---|--|
| FP0.1 | FIRE PROTECTION LEGEND, NOTES & DETAILS | |
| FP0.2 | FIRE PROTECTION DETAILS | |
| FP2.0 | | |
| FP3.1 | FIRE PROTECTION FLOOR PLANS | |
| | | |
| PLUMBING | | |
| P0.1 | PLUMBING LEGEND, NOTES & SCHEDULES | |
| P0.2 | PLUMBING DETAILS | |
| P2.0 | | |
| P3.1 | PLUMBING FLOOR PLANS | |
| P3.2 | PLUMBING FLOOR PLANS | |
| | | |
| HVAC | | |
| H0.1 | HVAC LEGEND & GENERAL NOTES | |
| H0.2 | HVAC LEGEND & GENERAL NOTES | |
| H0.3 | | |
| H0.4 | HVAC DETAILS | |
| H0.5 | HVAC DETAILS | |
| H0.6 | HVAC CONTROLS | |
| H1.1 | HVAC DEMOLITION PLAN | |
| H2.1 | HVAC LEVEL 1 FLOOR PLAN | |
| H2.2 | HVAC ROOF PLAN | |
| | | |
| ELECTRICAL | | |
| E0.1 | ELECTRICAL LEGEND AND NOTES | |
| E0.2 | ELECTRICAL SYSTEMS RISER DIAGRAMS | |
| E0.3 | | |
| E0.4 | ELECTRICAL SCHEDULES | |
| E0.5 | ELECTRICAL DETAILS | |
| E0.6 | ELECTRICAL DETAILS | |
| E1.0 | ELECTRICAL SITE PLAN | |
| E2.0 | FIRST FLOOR PLAN ELECTRICAL DEMOLITION | |
| E3.0 | FIRST FLOOR PLAN LIGHTING PLAN | |
| E3.1 | FIRST FLOOR PLAN ELECTRICAL POWER PLAN | |
| E3.2 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR | |
| | PART PLAN | |
| E3.3 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR | |
| | PART PLAN | |
| E3.4 | FIRST FLOOR PLAN ELECTRICAL FIRE ALARM PLAN | |
| E3.5 | FIRST FLOOR PLAN ELECTRICAL SECURITY PLAN | |
| E3.6 | ROOF ELECTRICAL PLAN | |
| E3.7 | ROOF ELECTRICAL LIGHTING PROTECTION PLAN | |

| T1.0 | TITLE SHEET |
|-------|-------------|
| | |
| CIVIL | |

1.3 SUMMARY

A. This project involves construction inside an existing structure. Contractors, by submitting a bid, are deemed to be completely familiar with the existing condition of the building as it influences the work described. Potential problems area shall be brought to the attention of the architect immediately.

1.4 GENERAL

- A. Any demolition shall be coordinated with Owner, Architect, G.C. and Engineer.
- B. Prior to any demolition or new work, testing and balancing contractor shall take CFM and static pressure readings at all locations where new systems are to connect to existing, and elsewhere as noted on plans. Submit to architect and engineer prior to starting new work.
- C. This contractor shall connect his work to various existing systems as indicated on the drawings. The new work shall be compatible with the existing system conditions.
- D. Drawings are diagrammatic; therefore determine exact locations of systems and components in field.
 - 1. Location of equipment or the routing of the various systems as well as openings in floor slabs or walls shall be governed by the existing conditions as they appear in the field.
 - 2. Care shall be taken during the installation of the new work, as not to damage or interrupt the existing building systems and services installed.
 - 3. All work shall be coordinated with all trades involved as well as with existing systems, the structure, and other obstructions.
 - 4. Shutdown of existing systems for connection of new work shall be coordinated in advance with the construction manager and building owner.
- E. Refer to architectural reflected ceiling plans for exact locations of air terminal devices.
- F. All materials and equipment shall be unused and of new manufacture, except for existing components indicated to remain and be reused.
- G. Access panels shall be provided to clean and service dampers, heaters, valves, and all concealed mechanical equipment.
- H. Install thermostats at mounting heights above finished floor in accordance with "ADA" requirements, or as directed otherwise by architect.
- I. Contractor shall provide the following services on all existing HVAC equipment indicated to remain:

- 1. Filter changes
- 2. Balancing
- 3. Lubrication
- 4. Clean coils
- 5. Calibrate controls
- 6. Verify fan rotation and operation
- 7. Verify controls operations
- 8. Clean condensate pan and trap
- 9. Verify pitch of condensate drain
- J. Contractor shall report any equipment deficiencies found to the owner and the architect and/or engineer.
- K. Work shall conform to the current in-force editions of the following:
 - 1. Sheet metal SMACNA standards
 - 2. Massachusetts state building code
 - 3. International mechanical code (IMC)
 - 4. International energy conservation code (IECC)
 - 5. All other applicable state and local ordinances
 - 6. Work shall also conform to base building specifications and standards
- L. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction.

1.5 SUBMITTALS

- A. Mechanical contractor shall submit for review, shop drawings for all material and equipment, contractor shall point out any deviations of the shop drawings from the design, schedule at least ten working days exclusive of transmittal time, for submittal review. Shop drawings may be paper or electronic. Electronic shop drawings shall be in searchable pdf format. In addition to the foregoing, submit paper shop drawings showing the following:
 - 1. Ductwork shop drawings and details. The routing of ductwork on the drawings is shown diagrammatically and approximately, as are the positions of new VAV boxes and other above-the-ceiling components. The contractor shall determine exact routing and locations, providing proper clearances, making provisions for maintenance access, and coordinating with existing and new components of other trades, the structure, and other obstructions. The ductwork shop drawing submittal shall be based on this coordination effort and shall show all air distribution components. Ductwork and components shall be drawn to scale, and duct sizes shall be indicated.
 - 2. Piping shop drawings showing layout, components, and details.
 - 3. Controls shop drawings, including equipment and system control schematics, sequences of operations, logic diagrams and system components including details of tie-in to existing building control management system.

1.6 AS-BUILT DRAWINGS

A. Maintain one set of prints on the site and note all changes or deviations from the original design thereon. At the completion of the project incorporate all changes into record as-built drawings in electronic format and submit cd for approval.

1.7 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Provide three sets of manufacturers operating and maintenance instructions for each piece of equipment and system. Compile into three hardcover three ring binders with index page and indexing tabs. All name tag information such as make, type, size, capacity, serial number, etc. Shall be included as part of the manual.

1.8 MOTORS, STARTERS, AND WIRING

A. Provide motors and controls, and furnish starters for HVAC equipment, except for units served by mcc which are provided under electric work. Provide control and other related wiring including interlocks. All motors shall to be premium efficiency. All three phase motors shall be rated for inverter duty service.

1.9 VIBRATION ISOLATION

A. Provide vibration isolation for each piece of rotating or reciprocating HVAC equipment shown on the drawings. All isolation components shall be supplied by a single manufacturer - mason industries or amber booth. Types of isolators, required deflections, and installation practices shall be in strict accordance with the recommendations of the vibration isolation manufacturer.

1.10 SEISMIC RESTRAINTS

A. Provide restraints as required by code. For each seismic restraint, provide certified calculations to verify adequacy to meet the following design requirements: ability to accommodate relative seismic displacements of supported item between points of support. Ability to accommodate the required seismic forces for each respective set of anchor bolts provide calculations to verify adequacy to meet combined seismic-induced sheer and tension forces. For each weldment between structure and item subject to seismic force, provide calculations to verify adequacy. Calculations shall be stamped by a professional engineer who is registered in the state where the work is being performed and has specific experience in seismic calculations. Restraints shall maintain the restrained item in a captive position without short circuiting the vibration isolation.

1.11 HANGERS AND SUPPORTS

A. Structural steel supports, hangers, etc. Shall be angle iron, steel channel or steel rod used with approved clamps, inserts, etc. All supports, hangers, brackets, etc., shall be as approved by the engineer. All hangers shall be galvanized or painted with two coats of Rustoleum paint before their installation.

B. Attach hangers and supports directly onto the structure by first removing existing fire proofing and after securing the attachment, repairing the fire proofing to its original condition, continuously over the attachment.

1.12 CLEANING

A. Entire installation and all work areas shall be left as clean as new. Clean internals of all ductwork and air handling units, and replace filters afterwards. Flush and clean piping.

1.13 PUNCH LIST

A. When the work is nearing completion, the HVAC contractor's project executive or designated representative shall physically walk down the installation, examining it in detail, and prepare a punch list containing an itemization of work remaining for 100% completion. Submit this to the engineer who will then inspect the work and prepare the engineer's punch list. Contractor shall complete all punch list items to the satisfaction of the owner and architect/engineer.

1.14 START UP, TESTING, AND BALANCING

- A. Start up all systems, pressure test ductwork and piping, and balance systems including all new and existing registers, grilles, diffusers, and VAV boxes, to performance data shown on plans, schedules, and as specified.
- B. Do not cover or conceal work before testing and inspection and obtaining approval.
- C. Leaks, damage and defects discovered or resulting from startup, testing, and balancing shall be repaired or replaced to like-new condition with acceptable materials. Test shall be continued until system operates without adjustment or repair.
- D. Report on reporting forms, submitted to architect for approval in advance.
- E. Submit six (6) copies of testing and balancing reports to architect for approval.
- F. This contractor shall furnish all test mediums and dispose of all test mediums at an approved off site location after testing is complete.
- G. Note requirement above for CFM and static pressure readings prior to demolition.

1.15 GUARANTEE

A. Guarantee work of this section in writing for one year from date of Owner's acceptance of substantial completion. Repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to owner's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within contract price.

PART 2 - PRODUCTS

2.1 DUCTWORK AND AIR DISTRIBUTION EQUIPMENT

- A. Routing and Sizing of Ductwork
 - 1. Refer to general note "submittals", for routing. Where duct sizes are not indicated, contractor shall select sizes based on the CFM using the "low pressure duct sizing table."

| Airflow (CFM) | Round Duct Size(Inches) | Equivalent Rectangular Sizes (Inches x Inches) | | | |
|------------------|----------------------------|--|---------|---------|---------|
| 80-100 | 6 | 4 x 8 | 6 x 6 | | |
| 100-150 | 7 | 4 x 12 | 6 x 8 | | |
| 150-200 | 8 | 6 x 10 | 8 x 8 | | |
| 200-300 | 9 | 6 x 12 | 8 x 10 | | |
| 300-400 | 10 | 6 x 16 | 8 x 12 | 10 x 10 | |
| 400-500 | 11 | 6 x 20 | 8 x 14 | 10 x 10 | |
| 500-600 | 12 | 6 x 24 | 8 x 16 | 10 x 12 | |
| 600-750 | 13 | 8 x 18 | 10 x 14 | 12 x 12 | |
| 750-1000 | 14 | 8 x 24 | 10 x 16 | 12 x 14 | |
| 1000-1200 | 15 | 8 x 26 | 10 x 20 | 12 x 16 | 14 x 14 |
| 1200-1400 | 16 | 8 x 30 | 10 x 24 | 12 x 18 | 14 x 16 |
| 1400-1700 | 17 | 10 x 26 | 12 x 22 | 14 x 18 | 16 x 16 |
| 1700-1900 | 18 | 10 x 28 | 12 x 24 | 14 x 20 | 16 x 18 |
| 1900-2200 | 19 | 12 x 26 | 14 x 24 | 16 x 20 | 18 x 18 |
| 2200-2500 | 20 | 12 x 30 | 14 x 26 | 16 x 22 | 18 x 20 |
| 2500-2800 | 22 | 12 x 36 | 14 x 30 | 16 x 26 | 18 x 24 |

Low Pressure Duct Sizing Table

- B. Special Ductwork Requirements
 - 1. Internal air flow dimensions are shown for ducts. Contractor shall increase size for liner if applicable.
 - 2. Diffuser sizes shown are neck sizes; register and grille sizes are nominal.
 - 3. Provide flexible connections on all ducts connecting to fans and heat pumps. All ducts shall be grounded across flexible connection with flexible copper grounding straps.

- 4. Maximum length of flexible run-out to diffusers shall be 6'-0". Provide additional length of rigid duct (round or rectangular) on run-out as required. Sag shall not exceed 1/2" per foot of spacing between supports.
- 5. All ducts penetrating rated fire walls shall be provided with fire dampers and access doors.
- 6. Ductwork shall not run along full height partitions.
- 7. Patch and seal all existing openings in ductwork not utilized for new layout.
- 8. The inside of all unlined ductwork visible through a grille or diffuser shall be painted flat black.
- 9. When section of ductwork is not labeled for size, the larger size indicated on the connected duct shall prevail. Size of duct run-outs to diffuser shall equal diffuser neck size.
- 10. Duct branch connections and take offs shall be made with 45° connection, bellmouth or conical only. Spin in collars and straight taps shall not be used.
- 11. Elbows and bends for rectangular ducts shall have center line radius of 1.5 times duct width wherever possible. Where centerline radius is less than 1.5 times duct with, elbows shall be radius throat with radius heel and full length splitter vanes.
- C. Ductwork Materials and Pressure Rating
 - 1. Sheet metal ducts shall be constructed of hot dipped G90 galvanized sheet metal unless otherwise specified.
 - 2. Kitchen hood exhaust ducts shall be 16 ga. All welded carbon steel, installed in accordance with NFPA 96.
 - 3. Shower exhaust ductwork shall be (stainless steel) (aluminum) with (welded) (soldered) seams. Ductwork shall pitch towards showers.
 - 4. All medium pressure ductwork between main system fan and air terminal device shall be minimum 4"(wg) Pressure Class, Seal Class A, Leakage Class 6. All low pressure ductwork between terminal device and air outlets shall be minimum 2"(wg) Pressure Class, Seal Class B, Leakage Class 12
- D. Flexible Ductwork
 - 1. Flexible ductwork, connecting to uninsulated or unlined duct, shall be vinyl coated fiberglass cloth 0.0057" minimum thickness, 25 strands per inch minimum thread count with corrosion-resistant helical wire reinforcement, and rated for 12" w.c. positive pressure.
 - 2. Rating shall be 2" w.c. negative pressure with a maximum velocity of 4000 FPM. Flex-duct must be listed as a Class 1 connector according to UL 181 and shall meet the requirements of NFPA 90A - maximum ASTM E-84 fire hazard rating. Uninsulated flexible duct shall be equivalent to Flexmaster Type 4.
 - Flexible duct connected to insulated or lined duct shall be insulated with 1-1/2", 1/2
 Ib. Density fiberglass insulation and flame retardant (UL listed) vapor barrier, meeting ASTM E-84 rating.
- E. Fire Dampers
 - 1. Provide fire dampers and access doors throughout air distribution system as shown on drawings, and where ducts penetrate fire walls.

- 2. Fire dampers installed in systems that can remain in operation after damper has closed shall be dynamic type dampers. All other fire dampers may be static type fire dampers.
- F. Volume Dampers
 - 1. Provide manual adjustable volume dampers, with extended mount indicating and locking quadrants on each supply, return, and general exhaust duct takeoff, and at each takeoff to a register, grille, or diffuser (not all dampers are shown on drawings). Dampers shall be located as far upstream as possible in the branch duct or take off to minimize downstream noise.
- G. Diffuser, Registers & Grilles
 - 1. Provide diffusers, registers, and grilles for supply, return, and exhaust outlets, of size, type, material and design shown on drawings. Acceptable manufacturers shall be price. Tuttle & Bailey, Anemostat, Krueger, Price, or Metalaire. Sound pressure levels shall not exceed NC 25. Color and finish shall be selected by the architect.
- H. Acoustical Sound Lining
 - 1. Provide 1" thick acoustical lining by Certain-teed, Knauf, Owens Corning, or Manville for the following ductwork:
 - a. Supply and return air ductwork, including plenums, for minimum of 20 feet from air handling units.
 - b. The first 10'-0" of low pressure ductwork at the discharge of variable volume terminal boxes.
 - c. Exhaust ductwork, including plenums, for minimum of 20 feet from fans.
 - d. Ductwork indicated as lined on drawings.
 - e. All transfer air ducts.
 - 2. Materials and installation shall meet the following standards as applicable:
 - a. NFPA-90A, UL723, NFPA-255; SMACNA duct liner applications standard; SMACNA mechanical fasteners standard; adhesive and sealant council; adhesives standard for duct liner ASC-A-7001A; ASTM E-84 fire hazard classifications of 25 flame spread, 50 Smoke Developed, and 50 Fuel Contributed.
- I. Duct Silencers
 - 1. Provide prefabricated duct silencers as scheduled and as described herein, at locations shown on drawings, by Industrial Acoustics, United Sheet Metal, Vibro Acoustics, Semco, or Titus. Silencers shall have flame spread/smoke developed of 25/50 according to ASTM E-84.
 - 2. Minimum dynamic insertion loss and maximum self generated sound power levels shall be equivalent to Industrial Acoustics types "S," "MS," "ML," and "L." Minimum dynamic insertion loss shall be at 1000 FPM for high pressure drop silencers and 2000 FPM for medium and low pressure drop silencers.

- 3. Duct silencers shall be installed with appropriate inlet and outlet straight length duct conditions to maintain the manufacturer's tabulated pressure drops, without adjustment factors.
- J. Duct Insulation (External)
 - 1. Insulation shall be Certain-teed, Knauf, Manville, or Owens corning. Materials shall meet requirements of adhesive and sealant council standards and SMACNA. Insulate (existing and new) supply and fresh air ducts and plenums in concealed spaces and return duct not in ceiling plenum with at least 1 1/2" thick, 3/4 lb/cu.ft. Density, fibrous glass duct wrap, with foil-kraft flame resistant vapor barrier. ASTM E-84 fire hazard ratings shall be 25 flame spread. 50 smoke developed and 50 fuel contributed.
 - a. All supply ductwork and return ductwork insulation:
 - 1) Insulate with 2" thick fiberglass duct wrap with foil face.
 - 2) Supply ductwork located in attic space shall be insulated to minimum of R-8.
 - 3) Supply and return ductwork shall be insulated to a minimum of R-5.
 - b. Rooftop ductwork:
 - 1) Provide insulation, vapor barrier, and field applied jacket that complies with ASTM C 921 and rated for outdoor use.
 - All rooftop supply ductwork shall be insulated to a minimum of R-8. Roof top return ductwork shall be insulated to a minimum of R-8. Exhaust ductwork not to be insulated.
 - 3) Insulation at roof penetrations shall be sealed and flashed. Extend jacket of outdoor insulation a minimum of 2 inches below the top of the roof flashing. Seal jacket to roof flashing.
- K. Fans
 - 1. All fans shall have their air performance rated in accordance with AMCA and shall be licensed to bear the AMCA seal. Acceptable manufacturers for centrifugal fans shall be: Buffalo, Chicago, Trane, Peerless, or Greenheck. Acceptable manufacturers for vane and duct axial fans shall be: Joy, Woods, Hertzell, Aerovent, Chicago, or Buffalo. Acceptable manufacturers for utility sets shall be: Trane, buffalo, Peerless, Cook, Greenheck, or Barry. Acceptable manufacturers of roof exhausters, transfer fans, and ceiling exhaust fans shall be: Penn, Greenheck, or Cook.
- L. Variable Air Volume Boxes
 - 1. Provide variable volume boxes and fan boxes by Titus, Envirotec, Price, Krueger, or Anemostat. All boxes shall have pressure independent (pneumatic) (electronic) (direct digital) controllers and multi-point flow sensors. Units shall not deviate from the set minimum or maximum flow settings by more than 10%, regardless of inlet pressure. Inlet velocities shall not exceed 2000 FPM. Sound data shall be in accordance with noise criteria data shown on schedules and shall be certified in accordance with ADC Standard 1062. Box air leakage shall not be more than 2% of

maximum airflow. Provide integral (hot water) (electric) reheat coils sized as indicated on drawings. Units shall be lined with 1 1/2 pound insulation. Insulation shall be totally encapsulated to prevent fibers from entering airstream.

M. CRAWL SPACE VENTILATION FAN

- 1. Supply fan shall be as manufactured by Fantech or approved equal. Fan shall be ENERGY STAR rated, evaluated by Underwriters Laboratories and conform to UL safety standards.
- 2. Provide fan with speed controller, mounting kit, backdraft damper, filter rack, filter(s) and disconnect.

2.2 COOLING EQUIPMENT

- A. Packaged Direct Expansion (DX) Roof Top Unit
 - 1. Provide packaged DX roof top unit by Carrier, Trane, York or McQuay. Unit shall have DX cooling, gas heating and microprocessor based discharge air and variable air volume controls for VAV units. Provide variable speed drives for VAV units. Provide insulated prefabricated roof curb for mounting the unit. Provide all necessary safety controls for furnace or electric coils. Provide minimum of four stages of capacity control and hot gas bypass for compressor. Refrigerant shall be R-407a or R-410a.
 - 2. Provide the following accessories:
 - 1) Full economizer control
 - 2) Exhaust fan or return fan as indicated in schedule
 - 3) Low ambient control
 - 4) Microprocessor based controls with full interface compatible with bas
 - 5) Disconnect switch
 - 6) MERV 7 pre-filters and minimum MERV 13 secondary filters
 - 7) Provide single point power connection
- B. Split System Direct Expansion (DX) Air Conditioning
 - 1. Provide complete DX system for central station air conditioning units of types, sizes and capacities shown on schedules by Trane, Carrier, York or McQuay. System shall consist of matching air cooled condensing units, compressors, piping, controls, wiring and other accessories and appurtenances necessary to provide fully, automatically functioning system.
 - 2. DX air conditioning system shall be capable of starting and operating down to 0°f ambient. Low ambient operation shall be accomplished by varying the speed of condenser fan based on sensing of head pressure in refrigerant liquid line, by

modulating damper in condenser fan discharge based on refrigerant head pressure sensing, or by flooding the condenser coil with liquid refrigerant to maintain the desired condenser pressure. Provide time delay relay for timed bypass of the low pressure switch or other means to start condensing unit at 0°f without nuisance safety trip units. When specified, hot gas bypass is to be pre-piped integral to the unit.

- 3. Provide refrigerant piping between air-cooled condensing unit and ac unit. Provide all necessary auxiliaries and appurtenances. Refrigerant piping shall be ACR copper tubing with wrought copper fittings and brazed joints. Refrigerants shall be R-407a or R-410a.
- 4. Refrigerant suction lines, refrigerant hot gas bypass lines, condensate drain lines, and outdoor refrigerant liquid lines shall be insulated with 3/4" thick rigid closed cell foam insulation, Armstrong Rigid Armaflex, Manville, Owens Corning, or Halstead/Nomaco (Insultube), except in computer room plena and return air plenum piping shall be insulated with 3/4" fiberglass pipe insulation. All outdoor piping shall be additionally covered with weatherproof aluminum jacket.
- C. CRAC Unit
 - 1. Direct Expansion Coil
 - a. The evaporator section shall include evaporator coil, thermostatic expansion valve and filter drier.
 - b. The evaporator coil shall have 3.1 sq. ft. (0.29 sq.m) face area, 3 rows deep. It shall be constructed of copper tubes and aluminum fins and have a maximum face velocity as scheduled. An externally equalized thermostatic expansion valve shall control refrigerant flow. The evaporator coil shall be factory-charged with R-407C refrigerant and sealed. The evaporator unit can be coupled directly with a ceiling mounted condensing unit or mounted remote to the condensing unit.
 - c. The coil shall be provided with a condensate drain pan with an internally trapped drain line. The evaporator drain pan shall include a factory-installed float switch to shut down the evaporator upon high water condition
 - 2. Evaporator Cabinet Construction
 - a. The cabinet and chassis shall be constructed of heavy gauge galvanized steel, and shall be serviceable from one side. Mounting brackets shall be factoryattached to the cabinet. Internal cabinet insulation shall meet ASHRAE 62.1 requirements for Mold Growth, Humidity & Erosion, tested per UL 181 and ASTM 1338 standards.
 - 3. Air Distribution
 - a. The air distribution system shall be constructed with a quiet, direct-drive fan assembly equipped with double-inlet blower, self-aligning ball bearings and lifetime lubrication. Fan motor shall be permanent-split capacitor, high-

efficiency type, equipped with two speeds for airflow modulation. Dehumidification shall utilize the lower fan speed.

- b. Each system shall be as scheduled on Contract Drawings.
- c. System shall be suitable for plenum or ducted air distribution. Refer to 2.5.2 Air Filter Box, 2.5.3 Air Distribution Plenum and 2.5.4 High Static Blower Assembly.
- 4. Microprocessor Control
 - a. The control system shall be microprocessor-based, factory-wired into the system and tested prior to shipment. The wall-mounted control enclosure shall include a 2-line by 16-character LCD providing continuous display of operating status and alarm condition. An 8-key membrane keypad for setpoint/ program control, fan speed selection and unit On/Off shall be located below the display. The control display shall be field-wired to the control board using 4-conductor field-supplied thermostat wire.
 - b. Temperature and humidity sensors shall be located in the wall box, which shall be capable of being located up to 300 ft (91.4m) from the evaporator unit.
- 5. Monitoring
 - a. The LCD shall provide On/Off indication, operating mode indication (cooling, heating, humidifying, dehumidifying), fan speed indication and current day, time, temperature and humidity (if applicable) indication. The monitoring system shall be capable of relaying unit operating parameters and alarms to the Liebert® SiteScan monitoring system.
- 6. Control Setpoint Parameters
 - a. Temp. Setpoint $65-85^{\circ}F(18-29^{\circ}C)$
 - b. Temp. Sensitivity 1-9.9 $^{\circ}$ F (1-5 $^{\circ}$ C)
 - c. Humidity Setpoint 20-80% RH
 - d. Humidity Sensitivity 1-30% RH
- 7. Unit Controls
 - a. Compressor Short-Cycle Control The control system shall prevent compressor short-cycling by a 3-minute timer from compressor stop to the next start.
 - b. Common Alarm and Remote On/Off A common alarm relay shall provide a contact closure to a remote alarm device. Two (2) terminals shall also be provided for remote On/Off control. Individual alarms shall be "enabled" or "disabled" from reporting to the common alarm.

- c. Setback Control The control shall be user-configurable to use a manual setpoint control or a programmable, time-based setback control. The setback control will be based on a 5 day/2 day programmed weekly schedule with capability of accepting 2 events per program day.
- d. Temperature Calibration The control shall include the capabilities to calibrate the temperature and humidity sensors and adjust the sensor response delay time from 0 to 90 seconds. The control shall be capable of displaying temperature values in °F or °C.
- e. System Auto Restart For startup after power failure, the system shall provide automatic restart with a programmable (up to 9.9 minutes in 6-second increments) time delay. Programming can be performed either at the wall-mounted controller or from the central, sitemonitoring system.
- 8. Unit Alarms
 - a. The control system shall monitor unit operation and activate an audible and visual alarm in the event of the following factory preset alarm conditions:
 - 1) High Temperature
 - 2) Low Temperature
 - 3) High Humidity
 - 4) Low Humidity
 - 5) High Water Alarm Lockout Unit Operation
 - 6) High Head Pressure
 - 7) Loss of Power
 - 8) Compressor Short Cycle
 - b. Custom Alarms (2x)
 - 1) Humidifier Problem
 - 2) Filter Clog
 - 3) Water Detected
 - 4) Smoke Detected
 - 5) Custom 1

6) Custom 2

- c. User-customized text can be entered for the two (2) custom alarms.
- d. Alarm Controls each alarm (unit and custom) shall be separately enabled or disabled, selected to activate the common alarm (except for high head pressure).
- e. Audible Alarm the audible alarm shall annunciate any alarm that is enabled by the operator.
- f. Common Alarm- a programmable common alarm shall be provided to interface user selected alarms with a remote alarm device. Alarms shall be enabled or disabled from reporting to the common alarm.
- g. Remote Monitoring All alarms shall be communicated to the Liebert® site monitoring system with the following information: date and time of occurrence, unit number and present temperature and humidity.
- 9. Steam Generating Humidifier
 - a. The environmental control system shall be equipped with a steam generating humidifier that is controlled by the microprocessor control system. It shall be complete with disposable canister, all supply and drain valves, 1" (25.4mm) air gap on fill line, inlet strainer, steam distributor and electronic controls. The need to change canister shall be annunciated on the microprocessor wall box control panel. The humidifier shall have a capacity of 4.3 lb/hr (2.0 kg/h). An LED light on the humidifier assembly shall indicate cylinder full, overcurrent detection, fill system fault and end of cylinder life conditions.
- 10. Electric Reheat
 - a. The electric reheat shall be low-watt density, 304/304 stainless steel, finnedtubular and shall be capable of maintaining room dry bulb temperature conditions when the system is calling for dehumidification. The reheat section shall include a UL-approved safety switch to protect the system from overheating. The capacity of the reheat coils shall as scheduled or indicated on Contract Drawings.
- 11. Disconnect Switch, Non-Locking
 - a. The non-automatic, non-locking, molded case circuit interrupter shall be factory mounted in the high-voltage section of the electrical panel. The switch handle shall be accessible from the front of the indoor unit.
- 12. Air Filter Box
 - a. The evaporator section shall be supplied with an air filter box for use with ducted installations. Two (2) filters shall be included 4" x 20" x 25" (102 mm

x 508mm x 635mm) each, deep-pleated type, with a MERV 8 rating, based on ASHRAE 52.2-2007.

- 13. Air Distribution Plenum
 - a. The evaporator section shall be supplied with an air distribution plenum with integral filter. The plenum shall be 24" x 48" (610mm x 1219mm) in size and shall provide 3-way air distribution, for installation into a standard 24" x 48" (610mm x 1219mm) ceiling grid. Filter size shall be 4" x 16" x 25" (102 mm x 406mm x 535 mm), deep pleated type with MERV 8 rating, based on ASHRAE 52.2-2007.
- 14. High Static Blower Assembly
 - a. A blower box shall be field attached to the evaporator to provide up to 2.0" (51mm) of external static pressure on the discharge side of the evaporator. The blower box shall contain a centrifugal type, double inlet blower, with belt drive and single speed motor, mounted to an adjustable motor base.
- D. CRCU Unit Outdoor Air-Cooled Prop Fan Condensing Unit
 - 1. Condensing unit components shall include a condenser coil, a direct-drive propellertype fan, a scroll compressor, high-pressure switch, Liebert® Lee-Temp[™] receiver and head pressure control valve, hot gas bypass system and liquid line solenoid valve. A hot gas bypass system shall be provided to reduce compressor cycling and improve operation under low load conditions.
 - All components shall be factory-assembled, charged with R-407C refrigerant and sealed. No internal piping, brazing, dehydration or charging shall be required. Condensing unit shall be designed for 95°F (35°C) ambient and be capable of operation to -30°F (-34.4°C).
 - 3. The condenser coil shall be constructed of copper tubes and aluminum fins.

4.

2.3 REFRIGERANT PIPING AND ACCESSORIES

- A. Furnish all pipe and fittings required for the HVAC systems, including refrigerant liquid (RLL) and refrigerant suction (RLS) piping.
- B. Refrigerant Piping (RLL, RLS):
 - 1. Pipe: Type L hard drawn ACR tubing, ASTM B280.
 - 2. Fittings: Wrought copper, ANSI B16.22.
 - 3. Joints: Silver solder, minimum 45% silver brazing alloy, cadmium free, ASTM B32
- C. Refrigerant Systems Accessories:
 - 1. Refrigerant Solenoid Valve: Provide a valve with sweat type valve connections, ductile iron and brass body construction, stainless steel and brass internal parts, teflon diaphragm, neoprene pilot seat, stainless steel springs and 120 volt/60 Hz coil assembly. Valve shall be sized in accordance with manufacturer's printed instructions.
 - 2. Thermal Expansion Valves: Provide valves of brass body with copper fittings, stemless steel diaphragms, brass and stainless steel internal parts, replaceable power element, factory maximum operating pressure charge to maintain super heat control over evaporator temperature range, 1/4" external equalizer connection, sweat connection in a straight through flow configuration and remote bulb with 60" tubing length.
 - 3. Hot Gas Bypass Pressure Regulating Valve: Provide valves of brass body with copper fittings, stainless steel diaphragm, brass and stainless steel internal parts, 1/4" external equalizer connection and sweat connection in a straight through flow configuration. Valves shall be sized for effective part connections in accordance with manufacturer's printed instructions.
 - 4. Refrigerant Sight Glass Moisture Indicator: Provide device of copper plated steel construction, removable leak proof fused sight glass with universal indicator element for R-22, clear liquid viewing area, scratch resistant glass and O-Ring for leak proof seal. Valve shall have sweat connections.
 - 5. Liquid Line Filter Dryers: Provide filter dryers of heavy gauge steel shell with corrosion resistant paint, copper plated sweat fittings, perforated baffle support plates, and filled with chemically inert molecular sieve head capable of filtering contaminated particles down to 20 microns.
 - 6. Pressure Relief Valves: Shall be of relief setting as indicated. Valves shall be of cast iron bodies with bronze seat rings in frame and flap and with bronze hinge pins.
Provide relief valve discharge piping to nearest floor drain. Valves shall be sized at indicated relief pressure in accordance with manufacturer's printed recommendations.

7. Flexible Piping Connections: Provide at refrigerant piping connections to ACCUs. Connections to be braided bronze construction with copper sweat ends; working pressure suitable for pressures encountered in systems.

2.4 ELECTRIC UNIT HEATERS

- A. Horizontal Electric Unit Heaters (EUH-1)
 - 1. Standard construction:
 - a. Horizontal type unit heaters as manufactured by Trane, Qmark, Markel or equal. Heating capacities to be as shown on the equipment schedule. All metal surfaces of the casing shall be phosphate coated to resist corrosion and finished in two-toned neutral grey bronze brown baked enamel. Heater shall be of the draw through air flow design. The heating back shall consist of metal sheath heating elements. Motors shall be of the totally enclosed, continuous heavy duty all angle operation equipped with built in thermal over load protection.
 - 2. All heaters shall be U.L. listed. Furnish with integral thermostat or space thermostat as indicated, support brackets and NEMA 1 disconnects.

2.5 HANGERS, SUPPORTS, ANCHORS, GUIDES, SLEEVES AND MISCELLANEOUS STEEL

- A. Pipe Hangers, Supports and Inserts:
 - 1. Carpenter and Patterson, Grinnell, Calco, or approved equal. Figure numbers listed are Carpenter and Patterson numbers.
 - 2. General: Piping systems shall be supported in accordance with ANSI B31.1 so as to maintain required pitch of lines, prevent vibration, and provide for expansion and contraction movement.
 - 3. Piping hangers and supports shall be furnished and installed for piping. Provide all components (i.e., inserts, rods, clamps, hangers, washer, lock nuts, rollers, etc.) necessary for a complete installation.
 - 4. Hangers:
 - a. Hangers for hot water supply (HWS), hot water return (HWR) piping shall be Figure 100SH refrigeration hanger and shield.
 - b. Hangers for all other piping shall be Figure 1A Bands.
 - c. All hangers shall be with supporting rods and nuts. Rod sizes shall be as follows:

| Hangers for pipes 4" and larger | 5/8" |
|----------------------------------|------|
| Hangers for pipes 2-1/2" and 3" | 1/2" |
| Hangers for pipes 2" and smaller | 3/8" |

5. Pipe covering protection saddles shall be Series 350 galvanized steel and shall be furnished for installation at each hanger where pipes are insulated.

Upper Attachments to Building Structure:

- a. Reinforced Concrete Construction: Upper attachment welded or clamped to steel clip angles which are expansion-bolted to the concrete. Expansion bolting shall be located so that piping loads place bolts in shear.
- b. Structural Framing: Upper attachments welded or clamped to structural steel members. Additional steel members may be necessary in some support locations where piping locations differ from that known on contract drawings.
- c. Submit details for approval.
- 6. Expansion Fasteners and Power Set Fasteners: In concrete ceiling construction, expansion fasteners may be used for hanger loads up to one-third the manufacturer's rated strength of the expansion fastener. Power set fasteners may be used for loads up to one-fourth of rated load. When greater hanger loads are encountered, additional fasteners may be used and interconnected with steel members combining to support the hanger.
- B. Pipe guides and Anchors:
 - 1. Furnish and install where shown on the drawings, a system of main anchors and pipe guides to control the expansion of the new water distribution piping. Temperature fluctuation shall be between 40°F and 240°F.
 - 2. Pipe guides shall be 4-finger spider-and-sleeve type to insure multiple guiding and to allow for complete insulation of piping. Spider and sleeve shall be formed of two halves to facilitate installation of spider on pipe and mounting of guide to structure. Guides shall be provided in accordance with "Standards of the Expansion Joint Manufacturer's Association", latest edition. Guides shall provide up to 6" of axial pipe movement. Assembly to be fabricated of carbon steel and finished with one coat of rust inhibitive paint.
- C. Pipe Sleeves:
 - 1. Furnish pipe sleeves for all pipes which pass through masonry floors and walls. Sleeves shall be Schedule 10 steel pipe. Sleeves shall be of the first possible size larger than the outside of the insulation jacket on covered piping and the first possible size larger than the outside of the piping on uncovered pipes.
 - 2. Sleeves shall be of sufficient length so as to be flush on either side of masonry walls, flush on underside of masonry floor and extend 2" above the finished floor.
- D. Escutcheon Plates:

1. Provide one piece or hinged type wall and ceiling expansion-type plates with round head setscrews or integral pipe clips. Provide recessed type for floors. For copper lines and in finished rooms provide minimum 18-gage spun brass, chrome plated over nickel plates. For all other areas, provide 18-gage enameled cast-iron or steel plates.

2.6 AUTOMATIC TEMPERATURE CONTROLS

- A. Provide complete system of automatic temperature controls by Invensys, Seimens, Johnson Controls, or equivalent. Control system shall be capable of performing all sequences of operation to conform with building standards. Individual control components may not be shown on contract documents, but ATC contractor shall provide all components and control wiring necessary for a complete operable system. ATC contractor shall be responsible for all system components, whether he subcontracts electrical and other work or not. All control valves shall be electrically actuated.
- B. All control wiring shall comply with the requirements of the electrical section of these contract documents.
- C. Wiring between fire alarm system and temperature control system, except for duct mounted smoke detectors, shall be by ATC contractor.
- D. Furnish and install all control components for a new direct digital system of automatic temperature controls. This direct digital system of automatic temperature control shall be complete in all respects including all labor, materials, equipment and services necessary and shall be installed by personnel employed by the ATC sub-contractor.
 - 1. Direct digital automatic temperature and energy monitoring and control (DDC) system using field programmable micro-processor based units (Stand-alone Digital Controllers or SDC's, Application Specific Controllers or ASC's) with communications to operator workstation.
 - 2. Central access to all point data shall be provided at the operator workstation in a windows environment. This operator interface shall allow multiple concurrent windows depicting point data, graphics, or trend data from any existing or new EMCS points.
 - 3. All control equipment to be fully proportioning, and the latest state of the art in manufacture and design.
- E. The control system provided to consist of all microprocessors, personnel computer, software, graphics, database entry, modem, transformers, transducers, relays, thermostats, dampers, damper operators, valves, valve operators and all other necessary control components, along with a complete system, interlocking and communication wiring/cabling to fill the intent of the specification and provide for a complete and operable system. Provide damper operators for equipment such as mixing dampers, where such operators are not supplied by the equipment manufacturers.
 - 1. Alarms, where applicable, and all interlocking wiring required to be provided by the ATC contractor.
 - 2. The ATC contractor to review and study all HVAC, electrical and HVAC drawings and entire specification to familiarize himself with the equipment and system

operation and to verify the quantities and types of dampers, operators, alarms, etc., he has to provide.

- 3. All interlocking wiring and installation of all required control devices associated with roof top units, exhaust fans, DX cooling, VAV boxes, unit heaters (each type), etc., to be provided by the ATC contractor. Close coordination to be exercised between the ATC contractor and the HVAC contractor and equipment manufacturers so that installation will be provided in a manner to result in fully operable systems, as intended in these specifications.
- F. Damper
 - 1. General:
 - 2. Automatic dampers, furnished by ATC contractor, shall be single or multiple blade as required and/or shown on the drawings.
 - 3. Numerous references are made in this specification as to the responsibility of furnishing and installation of dampers and operators. The ATC contractor shall closely coordinate his work with the HVAC contractor to assure that all dampers are provided as required, and he shall examine all pertinent specification sections to assure that all dampers required but not provided by equipment manufacturers are provided under this contract.
 - 4. All blank-off plates and conversions necessary to install smaller than duct sized dampers are the responsibility of the HVAC contractor.
 - 5. Dampers shall be installed by the HVAC contractor under the supervision of the ATC contractor.
 - 6. Operators shall be provided by the ATC contractor for all types of dampers whether they are provided by equipment manufacturer or by the ATC contractor.
 - 7. Dampers:
 - 8. All damper frames shall be constructed of 13 gauge galvanized sheet metal and shall have flanges for duct mounting. Dampers installed in stainless steel and aluminum duct work shall be constructed of type 316L stainless steel (frame and blades).
 - 9. Damper blades shall not exceed six (6) inches in width. All blades shall be of corrugated type construction, fabricated from two (2) sheets of 22 gauge galvanized sheet steel, spot welded together, blades shall be suitable for high velocity performance. Damper leakage shall be 2% or less at 5" W.C.
 - 10. All damper bearings shall be made of nylon. Bushings that turn in the bearings shall be oil impregnated sintered metal.
 - 11. Leakage and flow characteristic charts must be submitted to the Engineer prior to installation.
- G. Actuators And/Or Operators:

- 1. All damper actuators/operators shall be fully proportioning, unless otherwise specified. They shall be quiet in operation and shall have ample power to overcome friction for damper linkage and air pressure acting on louvers to position dampers accurately and smoothly. The damper actuator/operator mounting arrangement shall be outside the airstream wherever possible, with a maximum of 16 square feet per actuator/operator.
- 2. The actuators/operators shall be capable of operating at varying rates of speed to correspond to the dictates of the controllers and variable load requirements. The actuators/ operators shall be capable of operating in sequence when required by the sequence of operation. The actuators/operator shall have external adjustable stops to limit the stroke in either direction. The actuator/operator linkage arrangement shall be such as to permit normally open or normally closed positions of dampers as required.
- 3. All dampers sequenced with valves or dampers shall be furnished with pilot positioners or panel mounted positive positioning relays to ensure proper control sequencing.
- 4. For exact requirement and quantities of actuators/operators, see plans and coordinate with the HVAC contractor.
- H. Valve And Damper Actuators (Electronic):
 - 1. Actuators shall be of the gear train or hydraulic type.
 - 2. Actuators shall have integral mechanical stroke limiting adjustments to prevent actuator overstroke and automatic load sensing to protect from motor burnout in stall condition.
 - 3. All actuators shall be sized by the ATC contractor and guaranteed to provide torque and stroke characteristics for the applied duty. Output shall be compatible with outputs of the controlling device. All actuators shall be of the spring return type, linked normally open or closed as applicable and common to the application.
 - 4. All actuators shall be of the direct analog fully proportioning variety. Two position or floating type control actuators may be used only if specifically mentioned in the sequence of operation.
- I. Provide CO2 sensors to control the rate of ventilation air introduced into the spaces via the sequences outlined on the drawings
- J. The automatic temperature control contractor shall be available during the balancing and adjusting period to set damper positions in accordance with the balancing contractor's settings as indicated on the schedule sheets.
- K. Guarantee:
 - 1. In addition to the guarantee requirements of the contract and general conditions, the contractor shall obtain in the name of the owner the standard manufacturer's

guarantee of all materials furnished under this section where such guarantees are offered in the manufacturer's published product data. These guarantees are in addition to, and not in lieu of, other liabilities which the contractor may have by law or other provisions of the contract documents.

- 2. Upon completion of the installation, the ATC contractor shall submit to the owner an agreement to provide the necessary programmed maintenance, to keep the various control systems in proper working condition, for a period of one year commencing at final project acceptance. Additionally, this contractor shall submit to the owner its standard agreement to support the system operation. This service must include operators support, application support, remote diagnostic support (via remote, on-line telephone support services) as well as database management support. This service shall be available 365 days per year, 24 hours a day.
- 3. The programmed maintenance agreement shall fully describe the maintenance work to be performed and shall advise as to the cost of this work prior to awarding of contract.

PART 3 - EXECUTION

- 3.1 General
 - A. Install all items specified under Part 2 products, according to the applicable manufacturer's recommendations and shop drawings, the details shown on the drawings and as specified under this section. Provide all required hangers and supports.
 - B. Equipment
 - 1. Equipment shall be installed complete with all required hangers and supports in accordance with the manufacturer's recommendations.
 - 2. Furnish and install all steel structural support members for proper hanging and support of equipment. Provide vibration isolation on all hangers.
 - 3. All equipment shall be installed in strict conformance with manufacturer's written recommendations.
 - C. Miscellaneous Iron and Steel
 - 1. Provide steel supports and hangers required to support equipment, ductwork, and other equipment or materials. Submit details of steel supports and method of fabrication for approval.
 - D. Balancing
 - 1. The HVAC contractor shall engage the services of an independent firm to perform adjusting and balancing of the HVAC systems (air). Systems shall be adjusted and balanced so that air quantities are as indicated on the drawings and so that the distribution from supply outlets is free from drafts and uniform over the face of each outlet. After completion of the testing, balancing and adjusting of the air systems, a balancing report shall be submitted to the engineer for approval.

END OF SECTION 230000

SECTION 260000 – ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Attention is directed to the general and supplementary conditions and Division 01 including all sub-divisions thereof, as listed in the table of contents, which are hereby made a part of this Section.
- B. All work shall comply with all federal, state and local codes and any other authorities having jurisdiction.
- 1.2 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS:
 - A. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the City of Worcester, Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 at time and place stipulated in the "Invitation to Bid/Notice to Contractors". The following shall appear on the upper left hand of the envelope:

Name of Sub-Bidder: <u>Print Name of Sub-bidder</u>

Project: REGIONAL EMERGENCY COMMUNICATIONS CENTER

Sub-Bid for Section: <u>260000 – ELECTRICAL</u>

- B. Each sub-bid submitted for work under this Section shall be on forms furnished by the City of Worcester as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-Bid forms may be obtained at the Department of Public Works and Parks, Architectural Division, 50 Skyline Drive, Worcester, MA 01605 in person, or by written request.
- C. Sub-bids filed with the City of Worcester shall be accompanied by a BID BOND or CASH or CERTIFIED CHECK or a TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the City of Worcester in the amount of five (5) percent of the bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.
- D. Additional Requirements:
 - 1. Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:
 - 2. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-subtrade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid

openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

| Class of Work | Reference Specification | Paragraphs |
|---------------|-------------------------|------------|
| | | |
| | | |
| | | |

E. The work done by this sub-bidder is shown on the following drawings:

| T1.0 | TITLE SHEET |
|-----------------|--|
| | |
| CIVIL | |
| C1 | EXISTING CONDITIONS |
| C2 | DEMOLITION PLAN |
| C3 | EROSION AND SEDIMENT CONTROL |
| C4 | SITE PLAN |
| C5 | DRAINAGE AND UTILITIES |
| C6 | DETAILS |
| | |
| LANDSCAPE | |
| L1.0 | DEMOLITION SITE PLAN |
| L1.1 | LANDSCAPE PLAN |
| | |
| ARCHITECTURAL | |
| D1.0 | DEMOLITION PLAN-EXISTING PLAN & ELEVATIONS |
| A1.0 | EXISTING FOUNDATION WORK PLAN & DETAILS |
| A1.1 | FLOOR PLAN & DETAILS |
| A1.2 | FIRST FLOOR PLAN - ENLARGED |
| A1.3 | ROOF PLAN & DETAILS |
| A1.4 | COVERED TRAILER STORAGE |
| A2.1 | ELEVATIONS |
| A3.1 | BUILDING SECTIONS |
| A4.1 | WALL SECTIONS |
| A4.2 | WALL SECTIONS |
| A5.1 | SECTION DETAILS |
| A6.1 | INTERIOR ELEVATIONS |
| A6.2 | INTERIOR ELEVATIONS |
| A6.3 | INTERIOR ELEVATIONS |
| A7.1 | REFLECTED CEILING PLANS |
| A8.1 | SCHEDULES & DETAILS |
| | |
| FIRE PROTECTION | |
| FP0.1 | FIRE PROTECTION LEGEND, NOTES & DETAILS |
| FP0.2 | FIRE PROTECTION DETAILS |
| FP2.0 | FIRE PROTECTION DEMOLITION PLAN |
| FP3.1 | FIRE PROTECTION FLOOR PLANS |
| | |
| PLUMBING | |
| P0.1 | PLUMBING LEGEND, NOTES & SCHEDULES |

| P0.2 | PLUMBING DETAILS |
|------------|--|
| P2.0 | PLUMBING DEMOLITION PLAN |
| P3.1 | PLUMBING FLOOR PLANS |
| P3.2 | PLUMBING FLOOR PLANS |
| | |
| HVAC | |
| H0.1 | HVAC LEGEND & GENERAL NOTES |
| H0.2 | HVAC LEGEND & GENERAL NOTES |
| H0.3 | HVAC SCHEDULES |
| H0.4 | HVAC DETAILS |
| H0.5 | HVAC DETAILS |
| H0.6 | HVAC CONTROLS |
| H1.1 | HVAC DEMOLITION PLAN |
| H2.1 | HVAC LEVEL 1 FLOOR PLAN |
| H2.2 | HVAC ROOF PLAN |
| | |
| ELECTRICAL | |
| E0.1 | ELECTRICAL LEGEND AND NOTES |
| E0.2 | ELECTRICAL SYSTEMS RISER DIAGRAMS |
| E0.3 | ELECTRICAL SYSTEMS RISER DIAGRAMS |
| E0.4 | ELECTRICAL SCHEDULES |
| E0.5 | ELECTRICAL DETAILS |
| E0.6 | ELECTRICAL DETAILS |
| E1.0 | ELECTRICAL SITE PLAN |
| E2.0 | FIRST FLOOR PLAN ELECTRICAL DEMOLITION |
| E3.0 | FIRST FLOOR PLAN LIGHTING PLAN |
| E3.1 | FIRST FLOOR PLAN ELECTRICAL POWER PLAN |
| E3.2 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART PLAN |
| E3.3 | FIRST FLOOR PLAN ELECTRICAL RAISED FLOOR PART PLAN |
| E3.4 | FIRST FLOOR PLAN ELECTRICAL FIRE ALARM PLAN |
| E3.5 | FIRST FLOOR PLAN ELECTRICAL SECURITY PLAN |
| E3.6 | ROOF ELECTRICAL PLAN |
| E3.7 | ROOF ELECTRICAL LIGHTING PROTECTION PLAN |

1.3 SCOPE OF WORK

- A. Conditions of the Contract and Division 01, General Requirements, apply to work of this Section. Where Paragraphs of this Section conflict with similar paragraphs of Division 01, requirements of this Section shall prevail.
- B. Examine Drawings and other Sections of Specifications for requirements that affect work of this Section.
- C. As used in this Section, "provide" means "furnish and install" and "HVAC" means "Heating, Ventilating and Air Conditioning" and "POS" means "Provided Under Other Sections". "Furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support," and "Install" means "to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project."
- D. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully

functional installation. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation. Remove all debris caused by contractors' work.

- E. Drawings are diagrammatic and indicate general arrangement of systems and work included in Contract. It is not intended to specify or to show every offset, fitting or component; however, Contract Documents require components and materials whether or not indicated or specified as necessary to make the installation complete and operational.
- F. Perform work strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and federal government, and other authorities that have lawful jurisdiction.
- G. Give notices, file plans, obtain permits and licenses, pay fees and obtain necessary approvals from authorities that have jurisdiction. All backcharges from the Utility shall be paid for by the Owner.
- H. As work progresses and for duration of Contract, maintain complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately, including work installed as a modification or addition to the original design.
- I. Work shall include, but shall not be limited to, the following:
 - 1. Temporary Lighting and Power
 - 2. Installation and wiring of motor starters and controls.
 - 3. Motor connections and controls.
- J. The work under this Section shall include the furnishing of all materials, labor, equipment and supplies and the performance of all operations to provide complete working systems, in general, to include the following items:
 - 1. Raceways and conduit
 - 2. Outlet Boxes
 - 3. Cable Supports and Boxes
 - 4. Multioutlet Assemblies
 - 5. Cable tray systems
 - 6. Junction boxes, Pull boxes and Cable Troughs
 - 7. Terminal connecting cabinets.
 - 8. Underground ductbank and manhole system

- 9. Main Switchboard (Fusible Switch)
- 10. Main Switchboard (480/277 V)
- 11. Main Switchboards
- 12. Wire and cable
- 13. Branch circuit wiring
- 14. Wiring devices and plates
- 15. Poke through wiring devices
- 16. Secondary switchboard(s) (switchgear).
- 17. Panelboards, circuit breakers.
- 18. Dry type transformers.
- 19. Safety disconnect switches (fused or unfused).
- 20. Fuses.
- 21. Access panels
- 22. Electric heating equipment and associated controls
- 23. Motor connections and controls.
- 24. Lighting fixtures including lamps and fuses as required.
- 25. Fluorescent ballasts
- 26. Exterior lighting system.
- 27. Standby emergency generator system.
- 28. Automatic transfer switch.
- 29. 6-12-24 V battery-powered emergency lighting system (SPEC VOLTAGE)
- 30. Short circuit protection and coordination study.
- 31. Building system grounding.
- 32. Lightning protection.
- 33. Fire alarm system, including provision of Construction Supervisory (tamper) switches for fire protection valves and furnishing of water flow switches and duct smoke detectors for installation under other Sections.
- 34. Security system, provide entire security system as defined on drawings and as defined in specifications.

- 35. Closed Circuit television system
- 36. Telephone conduit and outlet system.
- 37. Lighting Controls Energy management system.
- 38. Lighting contactors, relays and time switches
- 39. Sleeving.
- 40. Fire seal, (and) fire-proof foam.
- 41. Supervision and approval.
- 42. Electrical connections to HVAC and Plumbing equipment, laboratory equipment, kitchen equipment, computer equipment, and other equipment provided under other Sections or by Owner.
- 43. Nameplates, labels and tags.
- 44. Testing.
- 45. Operating and maintenance instructions and manuals.
- 46. Coordination drawings and shop drawings.

1.4 RELATED WORK

- A. Principal classes of Work related to the Work of this Section are listed below, and are specified to be performed under the indicated Sections of these Specifications. Refer to the indicated Sections for description of the extent and nature of the indicated Work, and for coordination with related trades. This listing may not include all related Work items. It is the responsibility of the Contractor to coordinate the Work of this Section with that of all other trades.
 - 1. DIVISION 01 General Conditions
 - 2. DIVISION 02- Existing Conditions
 - 3. DIVISION 03- Concrete
 - 4. DIVISION 04- Masonry
 - 5. DIVISION0 5- Metals
 - 6. DIVISION 06- Wood and Plastics
 - 7. DIVISION 07- Thermal and Moisture Protection
 - 8. DIVISION 08- Openings
 - 9. DIVISION 09- Finishes
 - 10. DIVISION 10- Specialties

| 11. DIVISION 11- | Equipment |
|------------------|---|
| 12. DIVISION 12- | Furnishings |
| 13. DIVISION 13- | Special Construction |
| 14. DIVISION 14- | Conveying Systems |
| 15. DIVISION 21- | Fire Suppression |
| 16. DIVISION 23- | Plumbing |
| 17. DIVISION 23- | Heating, Ventilating and Air Conditioning |
| 18. DIVISION 31- | Earthwork |

1.5 PRODUCTS FURNISHED, BUT NOT INSTALLED UNDER THIS SECTION

- A. Fire protection water flow switches and excess pressure pump kit for installation under Section 210000.
- B. Duct heat and smoke detectors; note that control wiring for fan shut-down will be provided under Section 230000.
- C. Emergency generator exhaust silencers and flexible connection(s) for installation under Section 230000.
- D. Copper pitchpot penetrations of roof for lightning protection system under Division 7.
- E. Wiring harness, consisting of two in-and-out wiring receptacles, to adapt lighting to flexible wiring system related to integrated ceiling system, under Division 13.
- F. Anchor bolts for poured-in-place light standard bases (furnish templates for placement) for installation under Division 03.
- G. Furnish pipe sleeves for placement into formwork by the General Contractor.
- H. Furnish access panels and doors for installation by the General Contractor.
 - 1. Furnish access panels for installation in walls, ceiling and floors at locations to permit access for adjustment, removal, replacement and servicing of all concealed equipment, valves and materials installed under this Section of the specifications.
 - 2. Access panels will be installed under the Section of the related trades of the finished surfaces in which they are located.
 - 3. Access panels shall be located in closets, storage rooms and/or other non-public areas if possible, positioned so that the equipment can be easily reached, and the size shall be sufficient for this purpose (min. 16" x 16"). When access panels are required in corridors, lobby or other habitable areas, they will be located as directed by the Owner's Representative.

4. Access panels shall be prime painted, keyed alike and provided with cylinder lock and two keys for each panel. Units shall be manufactured by Milcor, Inland Steel, Miami Carie or approved equal. Required fire resistance of walls and ceilings shall be maintained.

1.6 PRODUCTS INSTALLED, BUT NOT FURNISHED UNDER THIS SECTION

- A. Install the following items furnished under other Sections or by Owner.
- B. Starters, except starters in motor control centers, furnished under Sections 220000, and 230000.
- C. Motors will be furnished and set in place under other Sections.
- D. Adjustable frequency drives.
- E. Provide items for equipment installed under other Sections or Contracts or by Owner.
- F. Structural supports necessary to distribute loading from equipment to roof to floor except As specified.
- G. Temporary light, power, water, heat, gas and sanitary facilities for use during construction and testing.
- H. Automatic temperature control wiring except as noted on Drawings.
- I. Staging, scaffolding, ladders, chutes and other construction aids.
- J. Power wiring beyond supply points, control wiring and remote disconnects for burners in heating equipment.

1.7 **REFERENCES**

- A. For products or workmanship specified by association, trade, or federal standards comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. The date of the standard is that in effect as of the bid date, except when a specific date is specified. The organizations below set the standards for electrical codes referred throughout this specification.
 - 1. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
 - 2. AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
 - 3. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - 4. CODE OF FEDERAL REGULATIONS (CFR)
 - 5. FEDERAL SPECIFICATIONS (FS)
 - 6. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

- 7. INSULATED CABLE ENGINEERS ASSOCIATION (ICEA)
- 8. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
- 9. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
- 10. RURAL ELECTRIFICATION ADMINISTRATION (REA)
- 11. UNDERWRITERS LABORATORIES (UL)

1.8 DEFINITIONS

- A. As used in this Section, the following items are understood to have the following meaning:
 - 1. Contractor, unless otherwise qualified, shall mean the installer of the work specified under this Section.
 - 2. Furnish shall mean purchase and deliver to the project site, complete with every necessary appurtenance.
 - 3. Install shall mean unload at the delivery point at the site and perform all work necessary to establish secure mounting and proper operation at the proper location in the project.
 - 4. Provide shall mean "Furnish" and "Install".
 - 5. Work shall mean all labor, materials, equipment, apparatus, controls, accessories and all other items required for a proper and complete installation.
 - 6. Concealed shall mean hidden from sight in chases, furred-in spaces, shafts, hung ceilings, embedded in construction or in a crawl space. Areas to be concealed as part of tenant alterations to the building shall also be considered in this definition.
 - 7. Exposed shall mean not installed underground or concealed as defined above.
 - 8. Work by others shall mean work not provided by Electrical Subcontractor, but work furnished and/or installed by other Contractors (performing their respective work) as a part of this contract.
 - 9. Plumbing Contractor or Subcontractor shall be the Contractor responsible for the Work listed in Section 15400 of the Specifications.
 - 10. HVAC (Heating, Ventilating and Air Conditioning) Contractor or Subcontractor shall be the Contractor responsible for the Work listed in Section 15500 of the Specifications.
 - 11. ATC (Automatic Temperature Controls) Contractor or Subcontractor shall be the Contractor responsible for the Work listed in Section 15900 [15500] of the Specifications.
- 1.9 CODES, ORDINANCES, AND PERMITS

- A. Materials, installation of systems and equipment provided under this section shall be done in strict accordance with Massachusetts Department of Public Safety Codes, Massachusetts Department of Environmental Protection, Massachusetts State Building Code, 780 CMR, Massachusetts State Electrical Code, and any other Codes and Regulations having jurisdiction.
- B. Unless otherwise specified or indicated, materials, workmanship and equipment performance shall conform with the latest governing edition of the following standards, codes, specifications, requirements, and regulations, but not limited to:
 - 1. All Applicable NFPA Standards
 - 2. State and Local Building Codes
 - 3. National Electrical Code
 - 4. American Society of Testing and Materials
 - 5. American National Standards Institute
 - 6. Underwriters' Laboratories, Inc.
 - 7. Occupational Safety and Health Administration
- C. Give all notices, file all plans, obtain all permits and licenses, and obtain all necessary approvals from authorities having jurisdiction. Deliver all certificates of inspection to the authorities having jurisdiction. No work shall be covered before examination and approval by [Insert proper Owner here; ex. Owner's Representative], inspectors, and authorities having jurisdiction. Replace imperfect or condemned work to conform to requirements, satisfactory to Owner's Representative, and without extra cost to the Owner. If work is covered before inspection and approval, pay costs of uncovering and reinstalling the covering, whether it meets contract requirements or not.

1.10 GENERAL REQUIREMENTS

- A. Nameplates: Each major component of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment.
- B. Equipment Guards: Belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts so located that any person may come in close proximity thereto shall be completely enclosed or guarded. High-temperature equipment and piping so located as to endanger personnel or create a fire hazard shall be guarded or covered with insulation of type specified for service.

1.11 SUBMITTALS

A. Submit shop drawings and product data within thirty days after award of contract. Check, stamp and mark with project name submittals before transmitting to Architect. Indicate deviations from contract documents.

- B. Deviations from contract documents or proposed substitution of materials or equipment for those specified shall be requested in separate letter whether deviations are due to field conditions, standard shop practice or other cause.
- C. Within four weeks (except as noted otherwise) after award of contract and before ordering materials or equipment. Submit list of proposed materials and equipment and indicate manufacturer's names, addresses and identifying data. No consideration will be given to partial lists submitted out of sequence.
- D. Substitutions for scheduled lighting equipment will be rejected unless substitution submittal is received within ten days of contract award.
- E. Schedule at least ten working days, exclusive of transmittal time for submittal review.
- F. Product Data: Submit complete manufacturer's product description and technical information including:
 - 1. Raceways and conduit
 - 2. Surface metal raceway system
 - 3. Cable tray systems
 - 4. Pull boxes
 - 5. Terminal connecting cabinets.
 - 6. Underground ductbank and manhole system
 - 7. Main (secondary) electrical service.
 - 8. Wire and cable
 - 9. Primary cables and terminations
 - 10. Branch circuit wiring
 - 11. Wiring devices and plates
 - 12. Poke through wiring devices
 - 13. Secondary switchboard(s).
 - 14. Panelboards, circuit breakers.
 - 15. Dry type transformers.
 - 16. Safety disconnect switches (fused or unfused).
 - 17. Fuses. Access panels
 - 18. Electric heating equipment and associated controls
 - 19. Installation and wiring of motor starters and controls.

- 20. Motor connections and controls.
- 21. Lighting fixtures including lamps and fuses as required.
- 22. Fluorescent ballasts
- 23. Exterior lighting system.
- 24. Standby emergency generator system.
- 25. Automatic transfer switch.
- 26. Short circuit protection and coordination study.
- 27. Building system grounding.
- 28. Lightning protection system materials.
- 29. Fire alarm system, including provision of Construction Supervisory (tamper) switches for fire protection valves and furnishing of water flow switches and duct smoke detectors for installation under other Sections.
- 30. Security system
- 31. Telephone conduit and outlet system.
- 32. Lighting Controls Energy management system.
- 33. Lighting contactors, relays and time switches
- 34. Dimming system(s).
- G. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
 - 1. Do not submit multiple product information in a single bound manual.
 - 2. Three-ring binders shall not be accepted.
- H. In the event that this Contractor fails to provide Shop Drawings for any of the products specified herein:
 - 1. Contractor shall furnish and install all materials and equipment herein specified in complete accordance with these Specifications.
 - 2. If the Contractor furnishes and installs material and/or equipment which is not in complete accordance with these Specifications, he shall be responsible for the removal of this material and/or equipment from the Work, and shall be responsible for the replacement of this material and/or equipment with material and/or equipment which is in complete accordance with these Specifications, at the direction of the Owner's Representative.

- 3. Removal and replacement of materials and/or equipment which are not in complete compliance with these Specifications shall be executed by the Contractor at no extra cost to the Owner.
- 4. Removal and replacement of materials and/or equipment which are not in complete compliance with these Specifications shall not be allowed as a basis for a claim of delay of completion of the Work.

1.12 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data complete with at least the following:
 - 1. Table of Contents
 - 2. Introduction:
 - a. Explanation of manual and its use
 - b. Description of all systems
 - 3. Plant Operation
 - a. Operating instructions for all Electrical apparatus, as listed below.
 - 4. Maintenance
 - a. Maintenance and lubricating chart for generator: Furnish three sets of charts indicating equipment tag number, location of equipment, equipment service, greasing and lubricating requirements, lubricants and intervals of lubrication.
 - b. Recommended list of spare parts: Furnish two typed sets of instructions for ordering spare parts with sectional views of the equipment showing parts numbered or labeled to facilitate ordering replacements, including a list with itemized prices of those parts recommended to be kept on hand as spares, as well as the name and address of where they may be obtained.

1.13 MATERIAL AND EQUIPMENT STANDARDS

- A. Where equipment or materials are specified with the name of a manufacturer, such specification shall be deemed to be used for the purpose of establishing a standard for that particular item. No equipment or material shall be used unless previously approved by the Owner's Representative.
- B. Substitutions may be offered for review provided the material, equipment or process offered for consideration is equal in every respect to that indicated or specified. The request for each substitution must be accompanied by complete specifications together with drawings or samples to properly appraise the materials, equipment or process.
- C. If a substitution of materials or equipment in whole or in part is made, this SubContractor shall bear the cost of any changes necessitated by any other trade as a result of said substitution.
- D. All materials, equipment and accessories provided under this section shall be new and unused products of recognized manufacturers as approved.

1.14 RECORD DRAWINGS

- A. Refer to DIVISION 01, of the Specifications for record drawings and procedures to be provided under this section.
- B. Record Drawings (red-line drawings) will be updated by this Contractor monthly for review with the monthly requisition.

1.15 GUARANTEE

- A. Submit manufacturer's standard replacement warranties for material and equipment furnished under this Section. Such warranties shall be in addition to and not in lieu of all liabilities which the manufacturer and the Electrical Subcontractor may have by law or by provisions of the Contract Documents.
- B. All materials, equipment and work furnished under this Section shall be guaranteed against all defects in materials and workmanship for a minimum period of one year commencing with the Date of Substantial Completion. Any failure due to defective material, equipment or workmanship which may develop, shall be corrected at no expense to the Owner including all damage to areas, materials and other systems resulting from such failures.
- C. Guarantee that all elements of each system meet the specified performance requirements as set forth herein or as indicated on the Drawings.
- D. Upon receipt of notice from the Owner of the failure of any part of the systems during the guarantee period, the affected parts shall be replaced. Any equipment requiring excessive service shall be considered defective and shall be replaced.

1.16 COOPERATION AND COORDINATION WITH OTHER TRADES

- A. Materials and apparatus shall be installed as fast as conditions of the building will permit and must be installed promptly when and as required.
- B. Confer with all other trades relative to location of all apparatus and equipment to be installed and select locations so as not to conflict with work of other Sections. Any conflicts shall be referred immediately to the Owner's Representative for decision to prevent delay in installation of work. All work and materials placed in violation of this clause shall be readjusted to the Owner's Representative's satisfaction at no expense to the Owner.
- C. Where work of this section will be installed in close proximity to work of other sections or where there is evidence that the work of this section will interfere with work of other sections, assist in working out space conditions to make satisfactory adjustment. Prepare and submit for approval 3/8" scale or larger working drawings and sections, clearly showing how the work is to be installed in relation to the work of other sections.
- D. Keep fully informed as to the shape, size and position of all openings required for all apparatus, piping, ductwork, etc., and give information in advance to build openings into the work. Furnish all sleeves, pockets, supports and incidentals, and coordinate with the General Contractor for the proper setting of same.

- E. All distribution systems which require pitch or slope such as condensate drains and water piping shall have the right of way over those which do not. Confer with other trades as to the location of pipes, ducts, lights and apparatus and install work to avoid interferences.
- F. Fire Protection, Plumbing, HVAC, Electrical and any other systems shall be shown and coordinated on these transparencies in the order listed by the respective contractors.
- G. This Contractor shall, with the approval of the Owner's Representative and without extra charge, make reasonable modifications in his work as required by normal structural interferences, or by interference with work of other trades, or for proper execution of the work.

1.17 COORDINATION DRAWINGS

- A. The Electrical Sub-contractor, the Plumbing Sub-Contractor, the HVAC Sub-contractor and the Contractor shall coordinate all Electrical, plumbing and HVAC work with that of each trade, in order to:
 - 1. Avoid interferences between general construction, mechanical, electrical, structural and other specialty trades.
 - 2. Maintain clearances and advise other trades of clearance requirements for operation, repair, removal and testing of mechanical equipment.
 - 3. Indicate aisleways and accessways required on coordinated shop drawings for mechanical equipment rooms, electrical rooms, computer rooms, and kitchens.
 - 4. Coordinate location of sleeves and inserts, including setting in place prior to pouring concrete.
- B. Electrical Coordination Drawings:
 - 1. The Electrical Sub-Contractor shall prepare Coordination Drawings showing all work to be installed as part of Section 26 00 00. The Coordination Drawings shall be on 4 mil reproducible mylar at not less than 1/4 inch for Mechanical and Electrical spaces and at 1/8 inch for all other areas. The HVAC Coordination Drawings shall show all equipment, ductwork, pipes, sleeves, inserts, and supports.
 - 2. The Electrical Sub-Contractor, after showing all of the Electrical work, shall forward the reproducible coordination drawings to the General Contractor.
 - 3. The sequence of Coordination Drawings shall be HVAC, Plumbing and Electrical.
 - 4. The Electrical Sub-Contractor shall attend a series of meetings arranged by the Contractor to resolve any real or apparent interferences or conflicts with the work of the other contractors or with ceiling heights shown on the drawings.
 - 5. The Electrical Sub-Contractor shall then make adjustments to his work on the Coordination Drawings to resolve any real or apparent interferences or conflicts and forward to the Contractor.

- 6. After any real or apparent interferences and conflicts have been incorporated into the Coordination Drawings, the Contractor shall prepare the final Coordination Drawings and submit to the Architect.
- 7. The Electrical Sub-Contractor shall not install any of his work prior to the preparation of the final Coordination Drawings. If Electrical work proceeds prior to the final Coordination Drawings, any change to the Electrical work to correct the interferences and conflicts which result will be made by the Electrical Sub-Contractor at no additional cost to the Owner.
- 8. Coordination Drawings are for the Electrical Sub-Contractor's and Architect's use during construction and shall not be construed as replacing any shop, "as-built", or Record Drawings required elsewhere in these Contract Documents.
- 9. Review of Coordination Drawings shall not relieve the Electrical Sub-Contractor from his overall responsibility for coordination of all work performed pursuant to the Contract or from any other requirements of the Contract.

1.18 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

- A. It is the intention of the Specifications and Drawings to call for complete, finished work, tested and ready for continuous operation. Any apparatus, appliance, material or work not shown on the Drawings, but mentioned in the Specifications or vice-versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation, even if not particularly specified, shall be provided by the Electrical Subcontractor without additional expense to the Owner.
- B. The Drawings are generally diagrammatic. The locations of all items that are not definitely fixed by dimensions are approximate only. The exact locations must be determined at the project and shall have the approval of the Owner's Representative before being installed. The Subcontractor shall follow Drawings, including his shop drawings, in laying out work and shall check the Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions. Where space conditions appear inadequate, notify the Owner's Representative before proceeding with the installation. This Subcontractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.
- C. Refer to the Owner's Representative, Structural, Fire Protection, Plumbing and HVAC plans and coordinate location of all Electrical equipment.
- D. Size of conduits, cable trays, raceways and methods of running them are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that may be encountered. To carry out the true intent and purpose of the Drawings, all necessary parts to make complete approved working systems ready for use, shall be furnished without extra charge. All work shall be installed in such a manner as to avoid being unsightly.

1.19 INSPECTION OF SITE CONDITIONS

A. Prior to submission of bid, visit the site and review the related construction documents to determine the conditions under which the Work has to be performed. Send a report, in writing, to the Engineer, noting any conditions which might adversely affect the Work of this Section of the Specifications.

1.20 SURVEY AND MEASUREMENTS

- A. Base all required measurements, horizontal and vertical, from referenced points established by the Contractor and be responsible for correctly laying out the Work required under this Section of the Specifications.
- B. In the event of discrepancy between actual measurements and those indicated, notify the Contractor in writing and do not proceed with the related work until instructions have been issued.

1.21 DELIVERY, STORAGE AND HANDLING

- A. No materials shall be delivered or stored on site until Shop Drawings have been approved.
- B. All manufactured materials shall delivered to the site in original packages or containers bearing the manufacturer's labels and product identification.
- C. Protect materials against dampness. Store off floors, under cover, and adequately protected from damage.
- D. Deliver products to site and store and protect same under the provisions of DIVISION 01.
- E. Inspect all Fire Protection equipment and materials, upon receipt at the job site, for damage and correctness.

1.22 PROTECTION OF WORK AND PROPERTY

- A. This Contractor shall be responsible for the care and protection of all work included under this Section until the completion and final acceptance of this Contract.
- B. Protect all equipment and materials from damage from all causes including, but not limited to, fire, vandalism and theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment at no additional cost to the Owner.
- C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen under this Section and make good damage thus caused.
- D. Damaged materials are to be removed from the site; no site storage of damaged materials will be allowed.

1.23 SUPERVISION

A. Supply the service of an experienced and competent Construction Supervisor who shall be in charge of the Electrical work at the site.

1.24 SAFETY PRECAUTIONS

- A. Comply with all of the safety requirements of OSHA throughout the entire construction period of the project.
- B. Furnish, place and maintain proper guards for prevention of accidents and any other necessary construction required to secure safety of life and/or property.

1.25 SCHEDULE

A. Construct work in sequence under provisions of Division 01.

1.26 SPARE PARTS

A. Furnish spare-parts data for each different item of equipment furnished. The data shall include a complete list of parts and supplies, with current unit prices and source of supply; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment, or specified hereinafter to be furnished as part of the contract; and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 180 days at the particular installation. The foregoing shall not relieve this Contractor of any responsibilities under the guarantees specified herein.

1.27 HOISTING, SCAFFOLDING AND PLANKING

A. The work to be done under this Section of the Specifications shall include the furnishing, set-up and maintenance of all derricks, hoisting machinery, scaffolds, staging and planking as required for the work.

1.28 CUTTING AND PATCHING

- A. Provide all cutting and patching necessary for the proper installation of work to be performed under this Section.
- B. All work shall be fully coordinated with all phases of construction, in order to minimize the requirements for cutting and patching.
- C. Form all chases or openings for the installation of the work of this Section of the specifications, or cut the same in existing work and see that all sleeves or forms are in the work and properly set in ample time to prevent delays. Be responsible that all such chases, openings, and sleeves are located accurately and are of the proper size and shape and consult with the Architect and the Contractors or subcontractors concerned in reference to this work. Confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the approval of the Architect.
- D. Fit around, close up, repair, patch, and point around the work specified herein to match the existing adjacent surfaces and to the satisfaction of the Architect.

- E. Fill and patch all openings or holes left in the existing structures by the removal of existing equipment which is part of this Section of the Specifications.
- F. All of this work shall be carefully done by workmen qualified to do such work and with the proper and smallest tools applicable.
- G. Any cost caused by defective or ill-timed work required by this Section of the specifications shall be borne by the Subcontractor.
- H. When, in order to accommodate the work required under this Section of the specifications, finished materials of other trades must be cut or fitted, furnish the necessary drawings and information to the trades whose materials must be cut or fitted.

1.29 SLEEVES, INSERTS AND ANCHOR BOLTS

- A. Coordinate with other trades the location of and maintaining in proper positions, sleeves, inserts and anchor bolts to be supplied and/or set in place under this section of the specifications. In the event of incorrectly located preset sleeves, inserts and anchor bolts, etc., all required cutting and patching of finished work shall be done under this section of the specifications.
- B. Unless otherwise specified herein, all pipes passing through floors, walls, ceilings or partitions shall be provided with sleeves and rating shall be maintained by installation of fire stopping.
- C. Field drilling (core drilling), when required, shall be performed under this section of the specifications, after receipt of approval by the Construction Supervisor.
- D. When coring cannot be avoided, provide ¹/₄ inch pilot hole prior to coring. When coring through floor or slab, verify location of core on floor below and protect and piping, ductwork, wiring, furniture, personnel, etc., below the location of the core.

1.30 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS

- A. Provide all supplementary steel, channels and supports required for the proper installation, mounting and support of all Electrical equipment, piping, etc., required by the Specifications.
- B. Supplementary steel and channels shall be firmly connected to building construction in a manner approved by the Engineer.
- C. The type and size of the supporting channels and supplementary steel shall be determined by the Electrical Subcontractor and shall be of sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.

1.31 CERTIFICATES OF INSPECTION/APPROVAL

A. Furnish upon completion of all work, certificates of inspections from the manufacturers stating that authorized factory engineers have inspected and tested the operation of their respective equipment and found same to be in satisfactory operating conditions.

1.32 HAZARDOUS MATERIALS

- A. The work of this section will be performed where asbestos containing materials exist. For a listing of where asbestos containing materials exist in the building and what is required for abatement by the general contractor, refer to the Asbestos Abatement Specification in Division 1. Refer to these specifications for procedures to be followed in and around asbestos containing materials.
- B. Dispose of all hazardous materials in accordance with Federal and State laws.

1.33 ACCESSIBILITY

A. All work shall be installed so that parts requiring inspection, operation, maintenance and repair are readily accessible. Minor deviations from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made prior to written approval from the Engineer.

1.34 SEISMIC RESTRAINT REQUIREMENTS

- A. For each seismic restraint, provide certified calculations to verify adequacy to meet the following design requirements:
 - 1. Ability to accommodate relative seismic displacements of supported item between points of support.
 - 2. Ability to accommodate the required seismic forces.
- B. For each respective set of anchor bolts provide calculations to verify adequacy to meet combined seismic-induced sheer and tension forces.
- C. For each weldment between structure and item subject to seismic force, provide calculations to verify adequacy.
- D. Calculations shall be stamped by a professional engineer who is registered in the Commonwealth of Massachusetts and has specific experience in seismic calculations.
- E. Restraints shall maintain the restrained item in a captive position without short circuiting the vibration isolation.
- F. Provide seismic restraints conduit, lighting and equipment in accordance with the requirements of the Massachusetts State Building Code, 780 CMR, 8th Edition, and referenced requirements of BOCA and NFPA.

1.35 SEISMIC RESTRAINT

- A. Seismic restraint shall be installed in accordance with Massachusetts State Building Code, Sixth Edition, Chapter 16 and NFPA-13-96, Section 4-14.4.3:
 - 1. Maximum distance between braces in the lateral direction shall be 30 feet for piping 2" and smaller and 40' for piping 2-1/2" and larger.
 - 2. Maximum distances between braces in the longitudinal direction shall be 80 feet.

- 3. Tops of risers shall be provided with 4-way braces.
- 4. Flexible couplings shall be provided within 12" of floor and wall non-frangible penetrations and within 24" of all building expansion joints.
- 5. Hangers closest to the sway bracing shall be installed with an extended rod to the piping to resist upward movement of the piping.
- 6. Lateral sway bracing shall not be required on piping supported with rods less than 6" long.
- 7. Seismic bracing for lateral and longitudinal bracing may be of the splayed wire (tension type), or pipe and fixed hanger (tension type), and shall be complete with manufacturer's recommended sizing, locations, and calculations. One system only shall be installed.
- 8. C clamps for attachment to the building structure must be provided with retaining straps.
- 9. 4-Way bracing may be of the splayed wire type or fixed angle brace with U bolt.

PART 2 - PRODUCTS

2.1 RACEWAYS AND CONDUIT

- A. Rigid metallic conduit shall be zinc-coated steel that conforms to industry standards, by Allied Tube and Conduit, Republic Steel, Wheatland Tube or approved equal.
- B. Intermediate metal conduit (IMC) shall be zinc-coated steel that conforms to industry standards, by Allied tube and Conduit, Triangle/PWC or approved equal.
- C. Electrical metallic tubing (EMT) shall be zinc-coated steel that conforms to industry standards, by Republic Steel, Allied Tube and Conduit, Triangle/PWC or approved equal.
- D. Wireways shall be sheet steel with hinged spring-latched covers, galvanized or painted to protect against corrosion. Provide necessary bends, couplings, connectors and other appurtenances. Interior parts shall be smooth and free of sharp edges and burrs. Wireways shall be by Square D or approved equal.
- E. Non-metallic conduit shall be (Schedule 40) 100% virgin polyvinyl chloride (PVC), 90oC UL-rated, by Carlon or approved equal.
- F. Conduit shall meet NEMA requirements and the requirements of Article 347 of the NEC. Conduit shall be UL-listed.
- G. Conduit, fittings and solvent cement shall be by single approved manufacturer.
- H. Material shall have minimum tensile strength of 7,000 psi at 73.40F, minimum flexural strength of 11,000 psi, and minimum compressive strength of 8,600 psi.

- I. Aluminum conduit shall be rigid heavy-wall conforming to industry standards by Kaiser, Alcoa, Chase Brass or approved equal.
- J. Flexible metallic conduit shall be galvanized, spiral wrapped metallic conduit (Greenfield) or liquid-tight flexible metallic conduit as specified for specific equipment.
- K. Conduit expansion fittings shall be threaded hot-dipped galvanized malleable iron with internal bonding assembly by O.Z./Gedney or approved equal.
- L. Conduit fire seat fittings shall have heat-activated intumescent material for fire rating equal to or higher than that of floor or wall by O.Z./Gedney or approved equal.
- M. Provide water-tight gland sealing assemblies with pressure bushings as required for penetrations.
- N. Provide threaded malleable iron or steel connectors and couplings with insulated throats; manufactured elbows; locknuts; and plastic or bakelite bushings at terminations, as necessary. Couplings and connectors shall be gland and ring compression or stainless steel multiple point locking or steel concrete-tight set screw. Compression couplings and connectors shall form positive ground. Set-screw connectors and couplings shall have wall thickness equal to conduit, case-hardened, hex-head screws and separate ground wire. Bushings for rigid steel and aluminum conduit and connectors for EMT shall have insulating inserts that meet requirements of UL 514 flame test.

2.2 OUTLET BOXES

- A. Outlet boxes on concealed work shall be at least 4" square or octagonal, galvanized pressed steel with plaster rings as required. Outlet boxes for exposed conduit work shall be cast aluminum alloy with cast aluminum alloy covers.
- B. Where installed in plaster, boxes shall be fitted with galvanized steel plaster covers of required depth to finish flush with finished wall or ceiling.
- C. Switch boxes, receptacle boxes and other outlet boxes shall be standard 4" square with plaster rings or gang covers as required.
- D. Outlet boxes shall be by Steel City Electric Company, Appleton Electric Company, National Electric Products Company or approved equal.
- E. Outlet boxes for various systems and components shall be as required by manufacturer.
- F. Floor outlets shall be Steel City (Series 840 2" deep) heavy-wall cast iron bodies with edge frames and floor plates of polished bronze. Boxes shall be watertight, fully adjustable with interior leveling screws for precise adjustment, and adequate angular adjustment to meet off-level floor conditions. Provide insert floor plates with hinged covers for duplex receptacles or for telephone connection, if necessary. Provide carpet plates where required.

- G. Waterproof boxes shall be Condulet Cast Boxes with water-proof devices and covers. Provide hot-dipped galvanized corrosion-resistant epoxy enamel finish or PVC-coated products, where noted on Drawings.
- H. Provide screw-joint outlet boxes, with gasketed weatherproof covers in exterior locations, where exposed to moisture, at kitchen and cafeteria equipment with or next to water or steam connections, and where indicated as weatherproof on Drawings.
- I. Provide only enough conduit openings to accommodate conduits at individual location. Each box shall be large enough to accommodate number and sizes of conduits, wires and splices to meet NEC requirements, but shall be at least size shown or specified. Necessary volume shall be obtained by using boxes of proper dimensions. Box depths greater than 2-1/8" shall not be used to obtain necessary volume, but may be used with Owner's Representative's approval to facilitate installation. Standard concrete boxes may be 6" deep where necessary to permit entrance of conduits into sides of boxes without interference with reinforcing bars. Octagonal hung ceiling boxes with suspension bars may be 3-1/2" deep. Rectangular boxes for inter-connection of branch circuit conduits may be 2-1/2" deep.

2.3 CABLE SUPPORTS AND BOXES

- A. Provide cable supports and boxes for vertical feeders as required by NEC. Boxes shall be 10 gauge steel plates fastened to angle iron frame with removable covers secured with brass machine screws.
- B. Provide split wedge cable supports with clamps for cable without metallic sheath. Provide basket weave or approved equal cable supports approved by cable manufacturer for cable with metallic sheath. Supports shall be by O.Z./Gedney or approved equal.

2.4 MULTI-OUTLET ASSEMBLIES

- A. Fixed multi-outlet assemblies shall consist of surface metal raceway, 4"wide by 4" deep, and 20 A, 120 V (duplex) receptacles spaced 6"on center, as indicated on Drawings. Receptacles shall meet specified requirements. Phase and neutral conductors shall be at least No 12 AWG and shall have insulation specified for branch circuit conductors. Provide No. 12 AWG or larger green insulated equipment ground conductor in accordance with NEC. Ground conductor shall connect receptacle ground terminals and shall be secured to building equipment grounding system. Where more than one circuit serves similar receptacles in common raceway, do not connect adjacent receptacles to same circuit.
- B. Provide snap-on blank covers or snap-on receptacle covers or both, by raceway manufacturer, with no open cracks. Where industry standard device plates are installed on raceway, snap-on blank covers shall be accurately cut to avoid open cracks. Finish on device plates shall be _____.
- C. Provide suitable fittings, elbows, clips, mounting straps, connection blocks, insulators and associated hardware, as required. Provide 1/2" or larger rigid concealed conduit to connect raceway sections that are not continuous. Ground raceway to metallic conduit system.

D. Raceway and cover shall have neutral gray or buff standard factory finish.

2.5 CABLE TRAY SYSTEMS

- A. Provide (ladder) cable tray systems with straight sections, splice plates, bends, fittings, covers, expanded metal bottoms, hanger assemblies and other necessary components, sized for maximum size and weight cable used, but no wider than 24". Spacing between cable shall be 1/2 cable diameter. Increase spacing requirement as recommended by manufacturer to compensate for high ambient temperatures. Components shall be by single manufacturer.
- B. Construction: Ladder cable trays shall have 3" high side channels with cross channels on (12") centers.
- C. Maximum straight section lengths shall be manufacturer's standard but shall not exceed 24 feet.
- D. Expanded metal bottoms for basket of trough trays shall be reinforced with channels on 24" centers to ensure rigidity. Covers for basket trough tray shall be same construction as tray: expanded, louvered or solid metal, to meet applicable ventilation requirements. Clamps to tray.
- E. Design shall prevent contact between cut metal edges and cable.
- F. Materials: tray components shall be hot-dipped galvanized steel or aluminum alloy. Materials shall meet ASTM requirements.
- G. Fittings:
 - 1. Fittings for ladder tray shall have 24" bending radium to meet cable manufacturer's bending radius criteria.
 - 2. Fittings for basket and trough tray shall have minimum bending radius of 12".
- H. Simple beam deflection shall not exceed 0.004 of span based upon loads as follows:
 - 1. galvanized steel ladder @ 55 lbs./linear foot,
 - 2. galvanized steel basket or trough @ 45 lbs./linear foot,
 - 3. aluminum alloy ladder @ 40 lbs./linear foot, and
 - 4. Aluminum alloy basket or trough @ 50 lbs./linear foot.
- I. Provide cable tray supports spaced according to maximum deflection; spacing shall not exceed 12 feet. Provide galvanized steel wall brackets, hangers, clips, rods, beam clamps, spacers and associated support hardware suitable for 200% of permissible tray load. Bolts, screws and nuts shall be galvanized or shall have zinc or cadmium plate, with anti-corrosion coating.
- J. Provide bolting, hinged or mechanical clamp splice plates to form high pressure joints capable of bearing large short circuit currents to ground within 50oC temperature rise. Splice plates shall have sufficient cross-sections to prevent structural weakness at

joints. Obtain Owner's Representative's specific approval for use of hinged or mechanical clamp splices.

- K. Provide green insulated conductors to ground trays individually to equipment grounding system, sized to meet NEC requirements based on size of largest power conductor in tray. Ground shall be at least #6 and shall not exceed ampacity of #4/0 copper conductor.
- L. Work shall meet requirements of NEC Article 318.

2.6 JUNCTION BOXES, PULL BOXES AND CABLE TROUGHS

- A. Provide code gauge galvanized steel junction and pull boxes for conduit 1-1/4" trade size and larger, where indicated and as necessary to facilitate installation, of required dimensions, with accessible, removable screw-on covers. Provide junction and pull boxes in special sizes and shapes determined in field where necessary.
- B. Junction box covers shall be accessible. Do not install junction boxes above suspended ceilings except where ceiling is removable or where access panel is provided.
- C. Sheet metal pull boxes shall be supported adequately to maintain shape. Larger boxes shall have structural steel bracing welded into rigid assembly formed adequately to maintain alignment in shipment and installation. Secure covers with corrosion-resistant screws or bolts.
- D. Pull boxes exposed to rain or in wet locations shall be weatherproof.
- E. Pull boxes used with aluminum conduit shall be metal compatible with aluminum.
- F. Provide clamps, grids and other appurtenances to secure cables. No cable shall be unsupported for more than 30".
- G. No pull box shall be within 2 feet of another.
- H. Provided sealed, cast-alloy, hazardous-location boxes with sealing fittings in garages and other areas in which flammable gases or vapors may be present to prevent transmission of gases or vapors through conduits.
- I. Pull boxes connected to concealed conduits shall be mounted with covers flush with finished wall or ceiling. No aluminum pull box shall be embedded in concrete.
- J. Provide cable troughs of special shapes, design and construction required to install, support and enclose feeder cable throughout indicated routing. Troughs shall be as specified above for junction and pull boxes, with reinforcing, insulating supports and clamping for cable installation. Cables shall be continuous throughout troughs, and shall be racked in distributed phase groupings arranged with phase cables surrounding neutral conductors.
- 2.7 MAIN SWITCHBOARD (480/277 V)

- A. Switchboard shall be dead-front, totally-enclosed, self-supporting cubicle steel structure, with circuit breakers, meters and current transformers as specified and as shown on Drawings, by Eaton Cutler-Hammer Square D, or General Electric.
- B. Switchboard shall be designed for 480/277 V, 3-phase, 4-wire, with copper ground bus.
- C. Switchboard shall have gray enamel finish. Steel parts shall have two coats of zinc chromate primer before finish painting.
- D. Provide die-formed steel base assembly with formed steel and commercial channel welded or bolted together for rigid support necessary for moving on rollers and floor mounting. Framework shall be code gauge steel, rigidly welded and bolted together to support cover, plates, bussing, and component devices during shipment and installation.
- E. Switchboard section shall have open bottom and individual removable top plate. Top and bottom conduit area shall be shown and dimensioned on shop drawings. Wireway front covers shall be hinged. Provide hinged front plates for mounting meters, selector switches and other devices. Closure plates shall be screw removable. Provide hinged rear doors with three-point latch.
- F. Bussing shall be plated and of sufficient cross-sectional area to conduct continuously rated full load current with maximum temperature rise of 50oC, above ambient temperature of 40oC.
- G. Bus shall be rigidly braced to comply with integrated equipment rating of switchboard. Minimum bracing for short circuit faults shall be 65,000 A symmetrical rms.
- H. Main horizontal bus between sections shall run on back of switchboard. End section shall have bus bar provisions for future addition of switchboard section, with bus bars to extreme side of switchboard, prepunched to receive splice plates. Horizontal main bus bar supports, connection, and joints shall be bolted.
- I. Main disconnect shall be solid-state, manually-operated, insulated case circuit breaker, with adjustable long time and short time circuit pick-ups and adjustable ground fault trips. Breaker shall be 100% equipment rated according to UL requirements. Ensure proper trip settings on main circuit breaker, including coordination with utility fusing requirements.
- J. Sub-main breakers shall be current-limiting molded case or molded case circuit breakers as shown on Drawings.
- K. Provide isolated solid neutral bus and required lugs. Provide 1/4" x 2" equipment grounding bus on top rear of switchboard. Both neutral and ground bus shall extend full length of switchboard and shall be bolted to each section. Provide lugs on ground bus.
- L. Provide meters as shown on Drawings.
 - 1. Voltmeter shall have six-position switch and 0-480 V scale.
 - 2. Ammeter shall have 0-2000 A scale.

- 3. Wattmeter shall be General Electric Type DSM-54 with 14 minute demand register type M-30.
- 4. Provide pull-fuses in switchboard cabinet to protect meters.
- 5. Ammeter and voltmeter shall have OFF positions.
- 6. Switchboard shall be NEMA Class II.
- M. Provide black plastic nameplates with white-filled letters as shown on Drawings. Letters for main switch shall be 3/8" high; all other letters shall be 1/4" high. Mount nameplates with screws; adhesives will not be permitted.
- N. ill main busses to receive local power company current transformers. Furnish current transformers to switchboard manufacturer for installation, in manner approved by power company. Current transformer compartment shall meet power requirements.
- O. Provide empty 1-1/2" rigid steel conduit from switchboard to remote location for metering wiring by power company.
- P. Provide manufacturer's coordination study to establish proper settings of main and submain protective devices, as part of switchboard shop drawings.

2.8 MAIN SWITCHBOARD(S)

- A. Provide dead-front rigid switchboard with voltage rating shown on Drawings, approximately 90" high, formed of bolted vertical sections, with screwed-on sides and rear, and formed edge, hinged front.
- B. Provide small wiring, fuse blocks, terminal blocks and suitable numbering strips as required.
- C. Provide for rigging and skidding or rolling.
- D. Finish shall be ANSI 61 gray over phosphatized coating.
- E. Provide (copper) bus bars related to withstand maximum short-circuit stresses when connected to supply system with 65kA fault capacity at rated voltage. Arrange main horizontal bus bar phases in same vertical plane. Provide full capacity neutral where shown on Drawings. Secure ground bus and lug to vertical sections length of switchboard. Conductor hardware shall be high-tensile strength, zinc-plated. Terminals shall be anti-turn solderless suitable for cable material.
- F. Provide cable pull boxes with cable tie down supports where shown on Drawings. Seal as required by Utility. Provide 1-1/2" empty conduit for remote meter wiring by Utility.
- G. Switchboard (Front-Accessible Panel-Mounted Breakers/Switches)
 - 1. Switchboard shall be wall-mounted Type WF. Sections shall be 20" deep. Service sections containing large ampacity main disconnects shall be deeper as shown on Drawings. Align sections flush against wall.

- 2. Construction shall allow maintenance of incoming line terminations, main device connections and main bus bolted connections without rear access. Feeder or branch devices shall be removable from front and shall be panel-mounted with device line and load connection accessible from front.
- H. Switchboard (Rear-Accessible Panel-Mounted Breakers/Switches)
 - 1. Switchboards shall be Type WRP. Align vertical sections front and rear with uniform depth as shown on Drawings.
 - 2. Internal devices except main disconnect shall be removable from front and shall be panel-mounted with line and load connections accessible from front. Main device and connections shall be accessible.

2.9 DRY TYPE TRANSFORMERS

- A. Provide dry type transformers as shown on Drawings. Unless specified otherwise, design, manufacture and testing of transformers shall meet requirements of NEMA No. ST 20 and UL Standards.
- B. Transformers shall have separate primary and secondary windings for each phase, except that three-phase transformers rated 15 kVA or less may have separate tee-connected windings. Primary winding of transformers rated 15 kVA or less shall have at least two taps, each providing 5% increment below full rated voltage. Each primary winding of each transformer larger than 15 kVA shall have four or six taps, two of which shall provide 2-1/2% increments above full rated voltage.
- C. Transformers rated 25 kVA or less shall have 150oC, 185oC, or 220o insulation system rated for continuous operation at rated kVA. Transformers rated higher than 25 kVA shall have 220oC insulation system and shall be rated for continuous operation at rated kVA. Transformer surface temperature rise shall not exceed 65oC.
- D. Provide suitable terminal compartment to accommodate required primary and secondary wiring connections and side or bottom conduit entrance. Transformers rated 25 kVA or less shall have terminal leads with factory-installed connectors arranged and supported in workmanlike manner. Transformers rated higher than 25 kVA shall have terminal boards equipped with factory-installed clamp connectors. Terminal compartment temperature shall not exceed 75oC when transformer is operating continuously at rated load with ambient temperature of 40oC. Terminals for wiring connections shall be suitable for copper or aluminum wiring.
- E. Sound levels determined by NEMA Standards, shall not exceed:

| Transformer Rating | Sound Level |
|------------------------------|-------------|
| 9 kVA or less | 40 dB |
| Over 9 but not over 50 kVA | 45 dB |
| Over 50 but not over 150 kVA | 50 dB |
| Over 151 but not over 300 | 55 dB |
| Over 300 kVA | 60 dB |

- F. Transformers 45 kVA and larger have integral vibration isolation supports between core and coil assembly and transformer enclosure. Transformers less than 45 kVA shall have integral or external vibration isolation supports. Connections to transformers shall be made with flexible metal conduit, no less than 18" nor more than 36" in length, or with approved isolating connectors.
- G. Transformers shall be air-cooled. Single phase transformers larger than 25 kVA and three-phase transformers larger than 15 kVA shall be fully enclosed in steel enclosures. Smaller transformers shall be fully enclosed in steel enclosures, with or without compound fill, or shall have exposed cores, impregnated windings, and steel enclosures for live parts.
- H. Unless shown otherwise on Drawings, transformers rated 25 kVA or less shall be suitable for wall-mounting; transformers larger than 25 kVA shall be suitable for floor or platform mounting. Submit shop drawings of wall brackets and platforms for transformers for approval.
- I. Provide electro-static shields where shown on Drawings.

2.10 WIRE AND CABLE (600 V INSULATION)

- A. Provide single-conductor, annealed copper wire and cable with insulation rated 600 V, of sizes specified and scheduled on Drawings, by General Electric, Rome, Okonite or approved equal, for secondary service, feeders, branch and system wiring. Wire insulated for 300 V may be used where voltage is less than 100 V, if isolated from higher voltages. Wire sizes shown and specified are American Wire Gauge for copper. Aluminum wire and cable of ampacities equal to copper wire and cable may be used for conductors #1/0 and larger
- B. Armored cable shall be Type AC 600 V copper with full-sized insulated ground conductor. Use if restricted by requirements of Paragraph entitled WIRING METHODS in Part 3 of this Section. Minimum size shall be #12 AWG unless specified otherwise.
- C. Wire #8 and larger shall be stranded; #10 and smaller shall be solid. Wire and cable shall have THWN-THHN or XHHW insulation.
- D. Motor control circuits and signal wiring may be #14 if NEC requirements are met. Branch circuits longer than 75' for 120 V and 175' for 277 V shall be at least #10 from panel to last outlet.
- E. Wiring within light fixtures and other high-temperature equipment shall have 150oC insulation as required by NEC.
- F. Cable for direct burial shall be UF.
- G. Splices and Terminations
 - 1. Make splices in branch circuit wiring with UL-listed, solderless connectors rated 600 V, of sizes and types required by manufacturer's recommendations with temperature ratings equal to those of wires. Splice connectors shall be screw-on.
Insulate splices with integral covers or with plastic or rubber friction tape to preserve characteristics of wire and cable insulation.

- 2. Provide standard bolt-on lugs with hex screws to attach copper wire and cable to panelboards, switchboards, disconnect switches and electrical equipment.
- 3. Make terminations and splices for conductors #6 and larger with corrosionresistant, high-conductivity pressure indent, hex screw or bolt-clamp connectors, with or without tongues, designed specifically for intended service. Connectors for cables 250 MCM and larger shall have two clamping elements or compression indents. Terminals for bus connections shall have two bolt holes.
- 4. Ampacity of splices and connectors shall be equal to those of associated wires and cables.

H. Arc-proofing

- 1. Provide flexible, flame-retardant, organic-composition-coated elastomer arcproofing tape on power cable in manholes and handholes, suitable to withstand 200 A arc for 30 seconds. Tape shall be self-extinguishing and shall not support combustion.
- 2. Apply tape in single, half-lapped layer as required by manufacturer's recommendations. Secure with strips of red plastic film tape on 208Y/120V conductors and yellow plastic film tape on 408Y/277V conductors.
- I. Provide three-ply marlin twine lacing or self-extinguishing nylon straps with -65 to 350oF range for bundling conductors.

2.11 FEEDER IDENTIFICATION

- A. Provide nonferrous identifying tags or pressure-sensitive labels for cables, feeders, and power circuits in vaults, pull boxes, manholes and switchboard rooms, at cable termination and in other locations.
- B. Tags or labels shall be stamped or printed to correspond with markings on Drawings or marked so that feeder or cable may be identified readily. If suspended tags are provided, attach with 1/32" diameter nylon 55-pound test monofilament line or slipfree plastic cable lacing unit.

2.12 COLOR CODING

A. Color code secondary service, feeders and branch circuit conductors as follows:

| 208/120 Volts | Phase | <u>480/277 Volts</u> |
|---------------|---------|----------------------|
| Black | А | Brown |
| Red | В | Orange |
| Blue | С | Yellow |
| White | Neutral | Gray |
| Green | Ground | Green |

- B. Colors shall be factory-applied entire length of conductors by one of the following methods except as noted and limited below:
 - 1. solid color compound,
 - 2. solid color coating,
 - 3. colored stripping (2 stripes 180 degrees apart),
 - 4. colored bands or hash marks with maximum spacing of 18",
 - 5. colored fibrous covering, or
 - 6. surface printing every 12", maximum spacing of 18".
- C. Branch circuit conductors #12 and #10 shall have solid color compound, solid color coating. Neutrals and equipment grounds shall have solid compound or solid color coating (white, gray and green), except that neutrals with colored stripe shall be used where required by NEC. Conductors #8 and larger with stripes, bands or hash marks shall have background color other than white, green and gray.
- D. Solid color coating, stripes, bands or hash marks shall be strongly adherent paint or dye, sufficiently wide and clear to be readily distinguishable after installation.
- E. Alternative field-applied color coding methods may be used for wire #10 or larger, with color code specified in Subparagraph A:
- F. Apply 3/4" colored pressure-sensitive plastic tape in half overlapping turns for 6" from all terminal points and in boxes in which splices or taps are made. Apply last two laps of tape with no tension. Do not cover cable identification markings.
- G. Identify with nylon, self-extinguishing, self-locking colored cable ties. Ties shall accommodate wire sizes 1/16" through 1-3/4" in diameter and shall not be less than 0.18" wide. Minimum tensile strength shall be at least 50 lbs. Temperature range shall be -650F to +3500F. Provide three ties to each wire at each terminal point starting 3" from terminal and spaced 3" apart and three ties to each wire in boxes where splices or taps are made with special tool or pliers, and cut off excess.

2.13 WIRE PULLING EQUIPMENT

- A. Provide polyethylene ropes for pulling wire.
- B. Provide fish wires in telephone conduits and other empty conduit systems required, without splices and with ample exposed lengths at each end.
- C. Provide wire pulling lubricants that meet applicable UL requirements as necessary.

2.14 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, UL 498.

- 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 5351 (single), 5352 (duplex).
 - b. Hubbell; HBL5351 (single), CR5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
- B. Hospital-Grade, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, UL 498 Supplement SD.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 8300 (duplex).
 - b. Hubbell; HBL8310 (single), HBL8300H (duplex).
 - c. Leviton; 8310 (single), 8300 (duplex).
- C. Weather-Resistant Convenience Receptacles, 125V, 20A: Comply with NEMA WD1, NEMA WD6 configuration 5-20R,
 - 1. Pass & Seymour; WR5362 (duplex).

2.15 GFCI RECEPTACLES

- A. General Description: Straight blade, non-feed-through-type. Comply with NEMA WD 1, NEMA WD 6, UL 498.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - Products: Subject to compliance with requirements, provide one of the following:
 a. Cooper; GF20.

2.16 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
 - 1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
 - 2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.
- 2.17 SNAP SWITCHES

- A. Comply with NEMA WD 1, UL 20.
- B. Switches, 120/277 V, 20 A.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
 - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
 - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
- C. Key-Operated Switches, 120/277 V, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221L.
 - b. Hubbell; HBL1221L.
 - c. Leviton; 1221-2L.
 - d. Pass & Seymour; PS20AC1-L.
 - 3. Description: Single pole, with factory-supplied key in lieu of switch handle.
- D. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 1995.
 - b. Hubbell; HBL1557.
 - c. Leviton; 1257.
 - d. Pass & Seymour; 125

2.18 OCCUPANCY SENSORS

- A. Wall-Switch Sensors:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - Products: Subject to compliance with requirements, provide one of the following:
 a. Cooper; 6111 for 120 V, 6117 for 277 V.

- b. Hubbell; WS1277.
- c. Leviton; ODS 10-ID.
- d. Watt Stopper (The); WS-200.
- 3. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).
- B. Wall-Switch Sensors:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; AT120 for 120 V, AT277 for 277 V.
 - b. Leviton; ODS 15-ID.
 - c. Pass & Seymour; OS300S
 - 3. Description: Adaptive-technology type, 120/277 V, adjustable time delay up to 20 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).
- C. Long-Range Wall-Switch Sensors:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; ATP1600WRP.
 - b. Leviton; ODWWV-IRW.
 - c. Pass & Seymour; WA1001.
 - d. Watt Stopper (The); CX-100.
 - 3. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, with a minimum coverage area of 1200 sq. ft. (111 sq. m).
- D. Long-Range Wall-Switch Sensors:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; ATD1600WRP.
 - b. Leviton; ODW12-MRW.
 - c. Pass & Seymour; WDT200
 - d. Watt Stopper (The); DT-200.

- 3. Description: Dual technology, with both passive-infrared- and ultrasonic-type sensing, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, and a minimum coverage area of 1200 sq. ft. (111 sq. m).
- E. Wide-Range Wall-Switch Sensors:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; ATP120HBRP.
 - b. Leviton; ODWHB-IRW.
 - c. Pass & Seymour; HS1001.
 - d. Watt Stopper (The); CX-100-3.
 - 3. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 150-degree field of view, with a minimum coverage area of 1200 sq. ft. (111 sq. m).
- F. Exterior Occupancy Sensors:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Leviton; PS200-10.
 - b. Watt Stopper (The); EW-100-120.
 - c. Description: Passive-infrared type, 120/277 V, weatherproof, adjustable time delay up to 15 minutes, 180-degree field of view, and 110-foot (34-m) detection range. Minimum switch rating: 1000-W incandescent, 500-VA fluorescent.

2.19 COMMUNICATIONS OUTLETS

- A. Telephone Outlet:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 3560-6.
 - b. Leviton; 40649.
 - 3. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.
- B. Combination TV and Telephone Outlet:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

- Products: Subject to compliance with requirements, provide one of the following:
 a. Cooper; 3562.
 - b. Leviton; 40595.
- 3. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e; and one Type F coaxial cable connector.

2.20 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: [Steel with white baked enamel, suitable for field painting]
 - 3. Material for Unfinished Spaces: [Galvanized steel].
 - 4. Material for Damp Locations: [Cast aluminum] with spring-loaded lift cover, and listed and labeled for use in "wet locations."
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant [, die-cast aluminum] with lockable cover.

2.21 FLOOR SERVICE FITTINGS

- A. Type: Modular, [flush-type], dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: [Rectangular], [die-cast aluminum] with satin finish.
- D. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: [Blank cover with bushed cable opening]

2.22 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 - 1. Wiring Devices Connected to Normal Power System: [As selected by Architect] unless otherwise indicated or required by NFPA 70 or device listing.
 - 2. Wiring Devices Connected to Emergency Power System: [Red]
 - 3. TVSS Devices: Blue.
 - 4. Isolated-Ground Receptacles: [Orange]

2.23 PANELBOARDS

- A. Provide UL-listed safety dead-front lighting and power panelboards where shown on Drawings and as scheduled. Panelboards shall meet or exceed requirements of NEMA Standard Publication PB-1, and UL-50 and 67. Provide cabinets with flush hinges and combination catch and lock. Provide wiring gutters to accommodate large multiple feeder cables and lugs. Except as shown otherwise on Drawings, wiring gutters shall be at least 4" for lighting and 208 V panels and 6" for 480 V panels.
- B. Where two section panels are required, bolt boxes together to form one unit. Trim shall be two-piece construction with doors of equal size over each section.
- C. Provide molded case, bolt-on, thermal-magnetic trip, single, two or three pole branch circuit breakers as shown on Drawings. Multiple pole breakers shall be single handle, common-trip.
- D. Main buswork of panels shall carry at least full rating of feeder overcurrent device that supplies panel.
- E. Panel separate equipment ground bus for each panelboard.
- F. Power and lighting panels shall have heavy-duty, continuous, section vertical-hinged to box section for access to wiring gutters in addition to trim door.
- G. Panelboards shall have integrated short circuit current rating equal to or greater than circuit breaker AIC ratings schedule on Drawings.
- H. Panels shall be by Square D, Type NQOB for 225 A and below, and I-line distribution for 400 A and above, or equal by Eaton-Cutler Hammer or GE or approved equal.
- I. Provide surface metal tubs ready for painting.
- J. Provide bus connections for future overcurrent device with suitable insulation and bracing to maintain proper short circuit rating and voltage clearances, where required on Drawings. Provide for ready insertion of future breaker.
- K. Provide UL-listed shunt trip attachment (120 V coil with 480 V to 120 V fused primary and secondary control power transformer) where shown on Drawings.
- L. Main bus bars shall be (copper) (aluminum), sized as required by UL standards to limit temperature rise on current-carrying parts to 50oC above ambient 40oC maximum.
- M. Provide 1/2" spacers for panelboards mounted at exterior walls below grade to establish 1/2" air space behind panel.
- N. Provide typed panel directories that show use of each circuit and electrical characteristics of panelboard.

2.24 AUTOMATIC CONTACTORS

A. Panelboards and multiple branch circuits shall be arranged for control by automatic contactors in panelboard bus work, where shown on Drawings. Provide NEMA-steel enclosures, factory-finished with hinged doors with suitable hinges and latch where required for individual mounting.

- B. Contactors shall have inductive contact rating as shown on Drawings; operating coil voltage shall be as required by control system.
- C. Contactors shall be single-coil, electrically-operated, (electrically-held), arranged for 2wire or 3-wire control. Positive locking shall be obtained without use of hoods, latches or semi-permanent magnets.
- D. Main contact shall be silver-surfaced and shall be protected by arcing contacts and magnetic blowouts with arc barriers. Contacts shall be renewable from panel front.
- E. Provide manual operating level.
- F. Contactors shall have integrally-fused control circuits.
- G. Contactors shall be by Automatic Switch Co., Russelectric, Square D or approved equal.

2.25 SAFETY DISCONNECT SWITCHES

- A. Provide quick-make/quick-break safety switches: Type HD, heavy duty, Class 3, Design 3, unless specified otherwise. Provide (stainless steel) NEMA 1 or NEMA 12 enclosure for dry applications and NEMA 3R for wet. Switches shall be rated 240 or 600 V minimum as required for voltage of associated circuit and shall be rated in horsepower. Fuses shall interrupt locked rotor current of associated motor or ten times full rates load current, whichever is greater.
- B. Mount switch parts on insulating bases to facilitate replacement from front of switch. Current-carrying parts shall be high-conductivity copper. Contacts shall be silvertungsten or plated. Provide positive pressure fuse clips and switch operating mechanism suitable for continuous use at rated capacity without auxiliary springs in current path.
- C. Switches shall withstand available fault current or let-through current before operating, without damage or rating change.

2.26 FUSES

- A. Provide current-limiting, high-interrupting-capacity fuses for equipment provided under this and other Sections. Except as specified otherwise, provide 10% spares at least three of each size, in cabinet in main electric room. Cabinet trim shall match that of panelboard trim. Coordinate with equipment manufacturers and with work of other Sections.
- B. Fuses larger than 600 A shall be Class L time delay Bussman KRP-C or approved equal. Fuses 600 A and smaller that serve motors, fusible circuit breaker panelboards, transformers and motor control centers shall be dual-element current limiting Class RKI or approved equal.
- C. Submit specific fuse locations, types, manufacturers and ratings. Test data will be waived if fuses are products of single manufacturer and selectivity is substantiated by published catalog data. Provide data for short circuit and protection coordination study as directed.

D. Switch sizes and fuse ratings shown on Drawings and specified represent general approximate values for each motor hp delineated. Coordinate fuse values with motor switch sizes. Obtain recommended fuse rating data from fuse manufacturer. In case of discrepancy between Contract Documents and manufacturer's recommendations, manufacturer's recommendations shall govern work. Revise switch sizes to accommodate recommended fuse values and revise assembled equipment as necessary. Furnish necessary change information to equipment manufacturers. Submit changes in switch sizes to Owner's Representative for approval. Certify that motor circuits have adequate short circuit protection with fuses provided.

2.27 LIGHTING SYSTEMS

A. General

- 1. Provide lighting fixtures and equipment complete, wired and assembled as specified and shown on Drawings.
- 2. This specification contains descriptive criteria. Where no manufacturer's name is listed as standard of quality, Owner's Representative's decision concerning the conformity of the product to Contract Documents requirements shall be final.
- 3. In addition to submittals requirements of Part 1 of this Section, shop drawing and product data submittals shall include physical dimensions, specify types and mounting details.
 - a. Equipment and materials that require product sample submittal are shown on Drawings.
 - b. Submit written statement that verifies coordination of fixture mounting with ceiling systems as specified, with date of verification.
- 4. Where lighting fixtures substitutions are allowed, in addition to submittal requirements, submit photometric report on substituted luminaire, prepared by independent laboratory. Report shall include candela values in at least three planes, except for axially symmetrical luminaires. Candela curves, foot-candle and lumen tables, and iso-footcandle contours are not acceptable. Submit product sample at Owner's Representative's request.

B. Lamps

- 1. Provide lamps by General Electric, Westinghouse or Sylvania, unless specified or shown on Drawings otherwise. Obtain most recently published performance criteria.
- 2. Lamps shall meet ANSI C78 requirements.
- 3. Guarantee lamps for 90 days after acceptance by Owner's Representative. Replace lamps that fail during that time at no cost to Owner.
- 4. Lamps shall be new unless specified or shown on Drawings otherwise.

- 5. Do not operate lamps before final inspection by Owner's Representative except for initial testing. Initial lumen output shall not be measured before 100 hours of operation.
- 6. Incandescent lamps shall meet LM-45 and LM-49 IES testing and measurement requirements.
- 7. Fluorescent lamps shall meet LM-9 and LM-40 IES testing and measurement requirements. Provide circuit interrupting lampholders.
- 8. High intensity discharge lamps shall be (metal halide) (high pressure sodium) (mercury vapor) (compact source iodide) and shall meet LM-47 and LM-51 IES testing and measurement requirements.
 - a. Provide date-coded bases.
 - b. Lamps in open-bottom luminaires shall be self-extinguishing should outer lamp envelope break.
- 9. Lamp Table

| Minim | um Initial | Minimum Lamp | Color | Volta | ge |
|-------|--------------|--------------|-------|-----------|--------|
| Code | Lumen Output | Life (hours) | | Temp (oK) | Rating |

C. Ballasts

- 1. General
 - Provide ballasts by General Electric, Advance, Universal or approved equal. Ballasts shall be ETL-CMB and UL-listed unless specified or shown on Drawings otherwise.
 - b. Ballasts shall have at least 0.9 power factor unless specified otherwise. Input voltage shall be as shown on Drawings.
 - c. Furnish manufacturer's two-year warranty, including replacement parts and labor. Date of manufacture shall be stamped on nameplate.
 - d. Ballasts shall not contain PCB.
- 2. Fluorescent Ballasts
 - a. Ballasts shall meet ANSI C82 and UL 935 requirements.
 - b. No more than two lamps shall be served by one ballast, unless specified on Drawings otherwise.
 - c. Ballasts shall have current leakage of less than 50 milliamperes.
 - d. Furnish GLR fuse and fuse holder sized and installed by luminaire manufacturer, in addition to internal ballast thermal protection.
 - e. Ballasts shall have sound rating A (20-25 dB) unless specified otherwise.
 - f. Indoor ballasts shall have starting temperature of at least 50oF.
 - g. Outdoor ballasts shall have starting temperature of at least 0oF for 430 mA and -20oF for 800-1500 mA.
- 3. Fluorescent Dimming Ballasts

- 4. High Intensity Discharge Ballasts
 - a. Ballasts shall meet ANSI C824 and UL-1029 requirements.
 - b. Input power shall be not more than 115% of lamp power.
 - c. Maximum ballast crest factors shall be:
 - 1) 1.5 mercury lamps,
 - 2) 1.8 for metal halide lamps and,
 - 3) 1.8 for high pressure sodium lamps.
 - d. Furnish KTK fuse and fuse holder, sized and installed by luminaire manufacturer, in addition to internal ballast thermal protection.
 - e. Indoor ballasts shall have starting temperature of at least 0°F.
 - f. Outdoor ballasts shall have starting temperature of at least -20°F.
 - g. Indoor encased ballasts shall be capable of operating in at least (105°F) (150°F) ambient temperature.
- 5. High Intensity Dimming Ballasts
- 6. SEE CATALOGS
- D. Luminaires
 - 1. General
 - a. Provide factory-wired luminaires that meet UL 57 and ANSI C81 requirements, of dimensions and in locations as shown on Drawings.
 - b. Finish shall be uniform with no defects such as whirls, discoloration, sand or dust spots, cracks or chips. Steel rustproofing shall be by five-stage cleaning cycle and iron or zinc phosphate coating with rust inhibitor.
 - c. Luminaires in damp or wet locations shall bear correct UL label as shown on Drawings. Luminaires in hazardous locations shall bear UL 885 and UL 1225 labels.
 - d. Luminaires that require incandescent or high intensity discharge lamps shall provide adequate ventilation.
 - e. Stems for pendant-mounted luminaires shall match luminaire finish. Provide self-aligning joints.
 - f. Provide safety chains on luminaires as shown on Drawings. Chains shall support eight times luminaire weight including fixture components. Maximum distance luminaire may fall shall be 1 foot.
 - 2. Fluorescent Luminaires
 - a. Provide factory-tested, 20 gauge (0.9 mm) or reinforced 22 gauge (0.8mm) steel or aluminum fluorescent luminaires unless specified or shown on Drawings otherwise.
 - b. Luminaires shall meet UL 542, UL 1570 and NEMA LE1-1974 requirements, as specified and shown on Drawings.
 - c. Photometric testing shall meet LM-41 IES requirements.

- d. Open strip fluorescent luminaires shall have spring-loaded or turret sockets.
- e. Recessed luminaires shall have provisions to replace ballast without removing luminaire from ceiling.
- f. Interior finish shall have at least 85% reflectance.
- g. Ballast sound rating shall be raised no more than 2 dB.
- 3. High Intensity Discharge Luminaires
 - a. Provide HID luminaires that meet UL 1572 and NEMA LE3 requirements as specified and shown on Drawings.
 - b. Photometric testing of indoor HID luminaires shall meet LM-46 requirements.
- 4. Lens Diffusers
 - a. Provide lenses of at least 1/8" thick, 100% clear acrylic, tinted acrylic or glass as shown on Drawings. Lenses shall not be inverted unless specified otherwise.
 - b. Acrylic lenses shall meet or exceed Grade 8 requirements of ASTM D-788 Table 2.
- 5. Acrylic lens prismatic pattern 20 shall have 1/8" square base male cones on base parallel to lens edge. Prism height shall be at least 0.05". Lens shall be KSH-20 or approved equal.
- E. Louver Diffusers
 - 1. Parabolic louver shall be at least 0.025" thick, semi-specular pre-anodized aluminum, as shown on Drawings.
 - 2. Metallic louvers shall be at least 20 gauge steel.
 - 3. Plastic louvers shall be 100% acrylic.
 - 4. Coated plastic louvers shall be destaticized polystyrene.
- F. Site Lighting
 - 1. Provide lighting, wiring, controls and other devices as specified and shown on Drawings.
 - 2. Equipment shall meet requirements of NEMA FA1-1973, Tubular Floodlighting Equipment, and NEMA SH5-1969 Tubular Steel, Aluminum Roadway Lighting Poles.
 - 3. Poles and luminaires shall be grounded with ground wire tied back to lighting panel.

2.28 LIGHTING FIXTURES

- A. Provide lighting fixtures, equipment and components where shown on Drawings, as listed in fixture schedules and as specified, wired and assembled. Provide approved aligner canopies, hangers and other appurtenances as required.
 - 1. HID fixtures shall have higher power factor, encapsulated ballasts, sound rating A and voltage indicated on fixture schedule, and shall be CBM-certified. Ballasts shall be by Advance Electric, G.E. or approved equal.
 - 2. Fluorescent fixtures shall have low loss, high efficiency, high efficiency, high power factor energy saving, 277 V or (120 V) ballasts, with sound rating A and shall be CBM-certified. Fluorescent lighting fixtures shall have Type P SLH or approved equal by G.E. Provide fuse holder and fuse for each ballast.
 - 3. Tungsten-halogen lamps shall be rated 130 V.
 - 4. Incandescent lamps shall be inside-frosted, extended service.
 - 5. High pressure sodium lamps shall be General Electric Lucalux or approved equal.
 - 6. Low pressure sodium lamps shall be by Norelco or approved equal.
- B. Verify ceiling constructions, and provide fixtures, ballasts, frames, rings and other accessories suitable for construction encountered.
- C. Coordinate installation of fixtures with installation of ceiling materials and suspension system.
 - 1. Ceiling-mounted fixtures shall be supported independent of hung ceiling with (threaded road) (or) (bow chain).
 - 2. In no case shall lighting fixtures be suspended from hung ceiling, conduit or duct. Fixtures shall be supported from structural members only.
 - 3. Provide unistruct below ducts from which to hang fixtures when fixture locations coincide with duct runs. Provide threaded rods to support unistrut.
 - 4. Investigate lighting fixture locations and supports to ensure that no interference exists between lighting fixture, supports and other equipment. Correct interferences as directed by Owner's Representative.
- D. Refer to fixture schedule for specific lamp requirements.
- E. Incandescent and tungsten halogen lamps shall not be operated, other than for initial testing, before final inspection.
- F. Provide polyester covers to protect fluorescent fixtures with parabolic louvers during construction.

2.29 ENGINE GENERATOR

A. Generator Set:

- 1. Requirements: The generator set shall be Standby Duty rated at 300 kW, 375 kVA, 0.8 power factor 480 V, 3-Phase, 60 hertz, including radiator fan and all parasitic loads. Generator set shall be sized to operate at the specified load at a maximum ambient of 85°F (29.4C) and altitude of 500.0 feet (152.4 m).
- 2. Standby Rating as defined by the following:
 - a. Typical Load Factor = 70% or less with variable load
 - b. Typical Hours per Year = 200 hours
 - c. Maximum Expected Usage = 500 hours/year
 - d. Typical Peak Demand = 80% of ESP rated kW with 100% of rating available for the duration of an emergency outage
- 3. Material and Parts: All materials and parts comprising the unit shall be new and unused.
- 4. Engine: The engine shall be diesel fueled, four (4) cycle, water-cooled, while operating with nominal speed not exceeding 1800 RPM. The engine will utilize incylinder combustion technology, as required, to meet applicable EPA non-road mobile regulations and/or the EPA NSPS rule for stationary reciprocating compression ignition engines. Additionally, the engine shall comply with the State Emission regulations at the time of installation/commissioning. Actual engine emissions values must be in compliance with applicable EPA emissions standards per ISO 8178 D2 Emissions Cycle at specified ekW / bHP rating. Utilization of the "Transition Program for Equipment Manufacturers" (also known as "Flex Credits") to achieve EPA certification is not acceptable. The in-cylinder engine technology must not permit unfiltered exhaust gas to be introduced into the combustion cylinder. Emissions requirements / certifications of this package: EPA TIER 3.
- 5. Engine Governing: The engine will be equipped with an isochronous electronic governor to maintain +/- 0.25% steady state frequency variation from steady state no load to steady state full load.
- 6. Generator:
 - a. Generator Specifications: The synchronous three phase generator shall be a single bearing, self-ventilated, drip-proof design in accordance with NEMA MG 1 and directly connected to the engine flywheel housing with a flex coupling. The generator shall meet performance class G3 of IEC. The excitation system shall enable the alternator to sustain 300% of rated current for ten seconds during a fault condition and shall improve the immunity of the voltage regulator to non-linear distorting loads. The excitation system shall be of brushless construction and be independent of main stator windings (either permanent magnet or auxiliary windings).
 - b. Automatic Voltage Regulator: The automatic voltage regulator (AVR) shall maintain generator output voltage within +/- 0.5% for any constant load between no load and full load. The regulator shall be a totally solid state design, which includes electronic voltage buildup, volts per Hertz regulation, over-excitation protection, shall limit voltage overshoot on startup, and shall be environmentally sealed.
 - c. Motor Starting: Provide locked rotor motor starting capability of 1311 skVA at 30% instantaneous voltage dip as defined per NEMA MG 1. Sustained voltage dip data is not acceptable.

7. Circuit Breaker:

- a. Specifications: Provide generator mounted 100% circuit breaker, molded case, 600 amp and trip, 3 pole, NEMA 1/IP22. Breaker shall utilize a solid state trip unit. The breaker shall be UL/CSA listed and connected to engine/generator safety shutdowns. Breaker shall be housed in an extension terminal box which is isolated from vibrations induced by the generator set. Mechanical type lugs, sized for the circuit breaker feeders shown on drawing, shall be supplied on the load side of breaker.
- b. Controls: Generator Set Mounted: Provide a fully solid-state, microprocessor based, generator set control. The control panel shall be designed and built by the engine manufacturer. The control shall provide all operating, monitoring, and control functions for the generator set. The control panel shall provide real time digital communications to all engine and regulator controls via SAE J1939.
- c. Environmental: The generator set control shall be tested and certified to the following environmental conditions.
 - 1) -40° C to $+70^{\circ}$ C Operating Range
 - 2) 95% humidity non-condensing, 30°C to 60°C
 - 3) IP22 protection
 - 4) 5% salt spray, 48 hours, +38°C, 36.8V system voltage
 - 5) Sinusoidal vibration 4.3G's RMS, 24-1000Hz
 - 6) Electromagnetic Capability (89/336/EEC, 91/368/EEC, 93/44/EEC, 93/68/EEC, BS EN 50081-2, 50082-2)
 - 7) Shock: withstand 15G
- d. Functional Requirements: The following functionality shall be integral to the control panel.
 - 1) The control shall include a 33 x 132 pixel, 24mm x 95mm, positive image, transflective LCD display with text based alarm/event descriptions.
 - 2) Audible horn for alarm and shutdown with horn silence switch
 - 3) Standard ISO labeling
 - 4) Multiple language capability
 - 5) Remote start/stop control
 - 6) Local run/off/auto control integral to system microprocessor
 - 7) Cooldown timer
 - 8) Speed adjust
 - 9) Lamp test
 - 10) Push button emergency stop button
 - 11) Password protected system programming
- e. Digital Monitoring Capability: The controls shall provide the following digital readouts for the engine and generator. All readings shall be indicated in either metric or English units.
 - 1) Engine:

- a) Engine oil pressure
- b) Engine oil temperature
- c) Engine coolant temperature
- d) Engine RPM
- e) Battery volts
- 2) Generator:
 - a) Generator AC volts (Line to Line, Line to Neutral and Average)
 - b) Generator AC current (Avg and Per Phase)
 - c) Generator AC Frequency
 - d) Generator kW (Total and Per Phase)
 - e) Generator kVA (Total and Per Phase)
 - f) Generator kVAR (Total and Per Phase)
 - g) Power Factor (Avg and Per Phase)
 - h) Total kW-hr
 - i) Total kVAR-hr
 - j) % kW
 - k) % kVA
 - l) % kVAR
- f. Alarms and Shutdowns: The control shall monitor and provide alarm indication and subsequent shutdown for the following conditions. All alarms and shutdowns are accompanied by a time, date, and engine hour stamp that are stored by the control panel for first and last occurrence:
 - 1) Engine Alarm/Shutdown
 - 2) Low oil pressure alarm/shutdown
 - 3) High coolant temperature alarm/shutdown
 - 4) Loss of coolant shutdown
 - 5) Overspeed shutdown
 - 6) Overcrank shutdown
 - 7) Low coolant level alarm
 - 8) Low fuel level alarm
 - 9) Emergency stop depressed shutdown
 - 10) Low coolant temperature alarm
 - 11) Low battery voltage alarm
 - 12) High battery voltage alarm
 - 13) Control switch not in auto position alarm
 - 14) Battery charger failure alarm
 - 15) Generator Alarm/Shutdown
 - a) Generator Over Voltage
 - b) Generator Under Voltage
 - c) Generator Over Frequency
 - d) Generator Under Frequency
 - e) Generator Reverse Power
 - f) Generator Overcurrent

- g. Inputs and Outputs:
 - 1) Programmable Digital Inputs: The Controller shall include the ability to accept six (6) digital input signals. The signals may be programmed for either high or low activation using programmable Normally Open or Normally Closed contacts.
 - 2) Digital Outputs: The control shall include the ability to operate six (6) programmable relay output signals, integral to the controller. The output relays shall be rated for 2A @ 30VDC.
 - 3) Discrete Outputs: The control shall include the ability to operate one (1) discrete outputs, integral to the controller, which are capable of sinking up to 300mA.
- h. Maintenance: All engine, voltage regulator, control panel and accessory units shall be accessible through a single electronic service tool. The following maintenance functionality shall be integral to the generator set control:
 - 1) Engine running hours display
 - 2) Service maintenance interval (running hours or calendar days)
 - 3) Engine crank attempt counter
 - 4) Engine successful starts counter
 - 5) 20 events are stored in control panel memory
 - 6) Programmable cycle timer that starts and runs the generator for a predetermined time. The timer shall use 14 user-programmable sequences that are repeated in a 7-day cycle. Each sequence shall have the following programmable set points:
 - a) Day of week
 - b) Time of day to start
 - c) Duration of cycle
- i. Remote Communications:
 - 1) The control shall include Modbus RTU communications as standard via RS-485 half duplex with configurable baud rates from 2.4k to 57.6k.
 - 2) Remote Monitoring Software: The control shall provide Monitoring Software with the following functionality
 - a) Provide access to all date and events on generator set communications network
 - b) Provide remote control capability for the generator set
 - c) Ability to monitor up to 12 generator sets
 - d) Ability to communicate via Modbus RTU or remote modem
 - 3) Local and Remote Annunciation: Remote Annunciator (NFPA 99/110, CSA 282)
 - a) Provide a remote annunciator to meet the requirements of NFPA 110, Level 1.

- b) The annunciator shall provide remote annunciation of all points stated above and shall incorporate ring-back capability so that after silencing the initial alarm, any subsequent alarms will sound the horn.
- c) Ability to be located up to 800 ft from the generator set.
- d) Locate remote annunciator outside of Main Emergency Electric Room.
- 8. Cooling System: The generator set shall be equipped with a rail-mounted, enginedriven radiator with blower fan and all accessories. The cooling system shall be sized to operate at full load conditions and 110°F* ambient air entering the room or enclosure (If an enclosure is specified). The generator set supplier is responsible for providing a properly sized cooling system based on the enclosure static pressure restriction.
- 9. Starting System:
 - a. Starting Motor: A DC electric starting system with positive engagement shall be furnished. The motor voltage shall be as recommended by the engine manufacturer.
 - b. Jacket Water Heater: Jacket water heater shall be provided and shall be sized to insure that genset will start within the specified time period and ambient conditions.
 - c. Batteries: Batteries A lead-acid storage battery set of the heavy-duty diesel starting type shall be provided. Battery voltage shall be compatible with the starting system.
 - d. Battery Charger: Battery Charger A current limiting battery charger shall be furnished to automatically recharge batteries. The charger shall be dual charge rate with automatic switching to the boost rate when required. The battery charger shall be mounted on the genset package or inside the genset enclosure/room.
- 10. Weatherproof Housing with Fuel Tank Base (9930)
 - a. A weatherproof, sound attenuated, walk-in type enclosure shall be provided to house the engine/generator and accessories. The enclosure is to be in compliance with the National Electrical Code (NEC), and the National Fire Protection Association (NFPA) for clearance around electrical equipment as specified. The enclosure shall conform to the following design criteria, and be manufactured by Pritchard-Brown (Div. of Enviro Industries), type 9910/9930.
 - 1) Rigidity wind test equal to 115 MPH
 - 2) Roof load equal to 50 lbs. per sq. ft.
 - 3) Floor load equal to 200 lbs. per sq. ft.
 - 4) Rain test equal to 4" per hour
 - 5) Certified to meet the BOCA basic bldg. and mech. codes
 - b. Test data on similar construction by manufacturer, reviewed by a P.E. licensed in the Commonwealth of Massachusetts, shall be available upon request.

- c. Enclosure will consist of a roof, fuel tank and rupture basin base, two(2) side walls, and two(2) end walls, of stressed skin, semimonocoque construction.
- d. The system shall include a cooling and combustion air inlet silencer section, an equipment enclosure section, and a cooling air discharge silencer section. It shall be designed to reduce source noise by an estimated average 25 dB(A) as measured at 1 Meter. The enclosure shall be designed as follows:
- e. Roof and walls shall each be of one-piece semi-monocoque construction. All framing members shall be 6063-T6 aluminum, or aluminized steel. Skin material shall be min. thickness 0.040" prepainted aluminum (roof shall be mill-finish). A minimum of six colors shall be available for enclosure exterior. Skin panels shall be hard-riveted to framing members on 3" centers maximum. Pop rivets and bolts are not acceptable fasteners to attach exterior skin to framing. Roof assembly shall be cambered to aid in rain runoff.
- f. Insulation in walls and roof shall be semi-rigid, thermo-acoustic, thickness as required to meet the noise criteria specified. Lining shall be perforated, mill-finish aluminum. Self-adhesive foam and loose or bat-type insulating materials will not be accepted.
- g. An integral fuel tank underframe with floor and rupture basin shall be supplied, consisting of the following: a rupture basin utilizing minimum 7 ga. steel channel perimeter walls and bottom; a U.L. listed (per U.L. 142) aboveground 1074 gallon capacity rectangular tank of minimum 12 ga. steel construction; and a floor system consisting of fabricated or structural steel crossmembers on centers averaging 16 inches. The crossmembers will be overlayed with OSB board topped with 14 ga. steel diamond plate. This wood/steel combination must be used for acoustic isolation of the generator set from base. The tank shall have venting and emergency venting per U.L. 142, lockable fill, low level and high level alarm contacts, and a D.C. electric analog level gauge. The crossmembers shall incorporate 3/8" thick steel tapping plates for genset mounting. The rupture basin shall have a float contact to indicate tank rupture, and the entire system shall be leak tested prior to installation.
- h. Four-point lifting provisions shall be provided at or near the enclosure base, with capacity suitable for rigging the entire assembly. Quality assurance procedures of the manufacturer shall include regular testing of the lift devices.
- i. Two (2) single personnel access doors shall be provided. Door shall consist of an extruded aluminum frame with skin material matching enclosure. Door shall be fully gasketed to form a weather tight perimeter seal. Hinges shall be forged aluminum with stainless steel pins, handle shall be stainless steel and padlockable, and lock mechanism shall be three-point, with panic hardware to allow opening from inside even when padlocked
- j. Air handling shall be as follows: Air will enter the enclosure through removable hood(s) or an integral, baffled plenum. Motor operated damper(s) will be provided, wired to open upon engine startup. Radiator discharge will be through a gravity operated damper and into a hood or vertical plenum, as dictated by airflow. The system shall not exceed 0.5" w.g. total external static pressure to ensure adequate airflow for cooling and combustion.
- k. A bolt-in-place removable wall panel shall be provided for maintenance and/or equipment installation.

- 1. Enclosure manufacturer shall provide all necessary hardware to internally mount the specified exhaust silencer(s) and maintain the weatherproof integrity of the system. Silencer and exhaust flex shall be insulated. Include a 10' stainless steel concentric exhaust extension when required by local code.
- m. The enclosure shall include A.C. and D.C. lighting, duplex receptacles, and an A.C. distribution panel. D.C. lights to have timer type switch. All devices in the enclosure, including specified generator set accessories, shall be prewired in E.M.T. by enclosure manufacturer. In addition, the manufacturer shall perform the system integration of all components in the enclosure mechanical and electrical.

2.30 AUTOMATIC TRANSFER SWITCH

- A. Automatic transfer switch shall consist of power transfer module and control module, interconnected to provide complete automatic operation. Automatic transfer switch shall be mechanically held and electrically operated by single-solenoid mechanism energized from source to which load is to be transferred. Switch shall be rated for continuous duty and shall be inherently double throw. Switch shall be mechanically interlocked to ensure only one of two possible positions: normal or emergency. Automatic transfer switch shall be suitable for use with engine- or turbine-driven emergency generator or other utility source.
- B. Main contacts shall be silver protected by arcing contacts 400 A and over. Contacts shall be blow-on configuration and segmented or brush construction in ratings 600 A and over. Operating transfer time in either direction shall not exceed one-sixth of one second.
- C. Contacts, coils, springs and control elements shall be removable from front of transfer switch without major disassembly or disconnection of power conductors.
- D. Control module shall have protective cover and shall be mounted separately from transfer switch. Sensing and control logic shall be solid-mounted on plug-in printed circuit boards. Printed circuit boards shall be keyed to prevent incorrect installation. Provide industrial control grade plug-in interfacing relays with dust covers.
- E. Automatic transfer switches with components of molded-case circuit breakers, contactors or components not designed for continuous duty or repetitive load transfer switching will not be accepted. Circuit breaker switches will not be accepted.
- F. Automatic transfer switch shall meet NEMA ICS 2-447 and UL-1008 standards and shall be UL-listed for use in emergency systems in accordance with NEC Articles 517 and 700, and rated in amperes for total system transfer including control of motors, electric-discharge lamps, electric-heating and tungsten-filament lamp loads as specified in Paragraph 30.9 of UL-1008.
- G. Transfer switches rated 400 A and less shall be suitable for 100% tungsten-filament lamp load. Switches rated above 400 A shall be suitable for 30% or 400 A tungsten-filament lamp load, whichever is higher.

- H. Automatic transfer switch shall be rated to withstand rms symmetrical short circuit current available at automatic transfer switch terminals.
- I. Operation: Automatic transfer switch control panel shall use solid-state sensing on normal and emergency for automatic positive operation.
 - Phases of normal shall be monitored line-to-line. Provide close differential voltage sensing. Pickup voltage shall be adjustable from 85% to 100% of nominal; dropout voltage shall be adjustable from 75% to 98% of pickup value. Transfer to emergency shall be initiated upon reduction of normal source to 85% of nominal voltage and retransfer to normal shall occur when normal source reaches 95% of nominal.
 - 2. Time delay to override momentary normal source outages shall delay transfer switch signals and engine starting signals. Time delay shall be field-adjustable from 0.5 to 6 seconds and factory set at 1 second.
 - 3. Time delay on retransfer to normal source shall be bypassed automatically if emergency source fails and normal source is available. Time delay shall be field-adjustable from 0 to 30 minutes.
 - 4. Unloaded running time delay for emergency generator cooldown shall be fieldadjustable from 0 to 5 minutes.
 - 5. Time delay on transfer to emergency shall be field-adjustable from 0 to 5 minutes for controlled timing of load transfer to emergency, where indicated.
 - 6. Independent single phase voltage and frequency sensing of emergency source: pickup voltage shall be adjustable from 85% to 100% of nominal; pickup frequency shall be adjustable from 90% to 100% of nominal; transfer to emergency shall occur upon normal source failure when emergency source voltage is 90% or more of nominal and frequency is 95% or more of nominal.
 - 7. Provide gold-plated contact that closes when normal source fails for initiating engine starting, rated 10 A, 32 V DC.
 - 8. Provide gold-plated contact that opens when normal source fails for initiating engine starting, rated 10 A, 32 V DC.
 - 9. Provide white signal light to indicate when automatic transfer switch is connected to normal source, and yellow signal light to indicate when automatic transfer switch is connected to emergency source.
 - 10. Provide three auxiliary contacts that are closed when automatic transfer switch is connected to normal and two auxiliary contacts that are closed when automatic transfer switch is connected to emergency. Contacts shall be rated 10 A, 480 V AC, 60 Hz.
- J. Provide engine generator exercising timer adjustable in 15-minute increments.
- K. Provide switches in NEMA 1 locking cabinet.

- L. In-Phase Motor Transfer SPEC FOR ASCO IF REQUIRED.
 - 1. Provide in-phase monitor to inhibit transfer of loads from emergency to normal sources and vice versa until sources are in phase.
 - 2. Transfer shall be initiated only when power sources are approaching synchrony and when relative phase angle crosses setpoint towards 0o.
 - 3. In-phase monitor shall operate accurately regardless of which source is at highest frequency. In-phase monitor shall be solid state, with gated silicon transistor circuitry to ensure positive and crisp operation independent of variations in voltage input of 70% to 110% of nominal, with temperature between 00 and 45oC.
 - 4. Repetitive accuracy throughout temperature and voltage ranges shall not exceed +30 (electrical) of setting. Monitor shall be capable of operating within frequency range of +3 Hz of nominal. Provide manual bypass circuit.

2.31 LIGHTNING PROTECTION SYSTEM

NOTE: Do not use a combination of materials that forms an electrolytic couple of such nature that corrosion is accelerated in presence of moisture unless moisture is permanently excluded from the junction of such metals. Where unusual conditions exist which would cause corrosion of conductors, provide conductors with protective coatings or oversize conductors. Where mechanical hazard is involved, increase conductor size to compensate for hazard or protect conductors by covering them with molding or tubing made of wood or nonmagnetic material. When metallic conduit or tubing is provided, electrically bond conductor to conduit or tubing at the upper and lower ends by clamp type connectors or welds (including exothermic).

- A. Main and Bonding Conductors: NFPA 780 and UL 96 Class I, Class II, or Class II modified materials as applicable.
- B. Copper: Provide copper conductors on nonmetallic stacks that do not weigh less than 144.83 kg per 305 meters (319 pounds per thousand feet), and provide cable such that the size of any strand in the cable is not less than No. 15 AWG. Provide thickness of web or ribbon on stacks that is not less than No. 12 AWG. Provide loop conductors that are comprised of copper conductors not smaller than No. 1/0 AWG.
- C. Air Terminals: Provide terminals in accordance with UL 96. Support air terminals more than 610 mm (24 inches) in length by suitable brace, with guides, not less than one-half the height of the terminal.
- D. Ground Rods: NOTE: The designer will determine the type and number of ground rods to be used based on local conditions and earth resistivity data. Copper clad steel rods will be specified for normal conditions. Galvanized coated steel or stainless steel rods will be used where low soil resistivities are encountered and galvanic corrosion may occur between adjacent underground metallic masses and the copper-clad rods. Stainless steel rods have a longer life than zinc coated steel, but use of these must be justified based on the higher cost. In high resistivity soils, [3050 mm] [10 foot] sectional rods may be used to obtain the required resistance to ground; however, where rock is

encountered, additional rods, a ground loop, or ground grid may be necessary. Coordinate and standardize rod selection for individual facilities with other specification sections. Provide [ground rods made of [copper-cladsteel] [stainless steel] [solid copper] conforming to conform to UL 467.] [galvanized ferrous rods conforming to ANSI C135.30.]Provide ground rods that are not less than 20 mm (3/4 inch) in diameter and 3050 mm (10 feet) in length.Do not mix ground rods of copper-clad steel, stainless steel, galvanized ferrous, or solid copper on the job.

- E. Grounding Plates: NOTE: The use of grounding plates is an acceptable alternative to ground rods in areas where excessive rock and surface ledge is encountered. Provide grounding plates made of [copper-clad steel][iron][stainless steel] [solid copper] conforming to UL 96.
- F. Connections and Terminations: Provide connectors for splicing conductors that conform to UL 96, class as applicable. Conductor connections can be made by clamps or welds (including exothermic).Provide style and size connectors required for the installation.
- G. Connector Fittings: Provide connector fittings for "end-to-end", "Tee", or "Y" splices that conform to NFPA 780.
- H. Lightning Protection Components: Provide bonding plates, air terminal supports, chimney bands, clips, and fasteners that conform to UL 96 classes as applicable.
- I. Designated cable that runs from 1st floor steel to ground shall be coursed in 1-1/4" rigid steel conduit, provided under this Section as required by Lightning Protection supplier. Conduits shall be encased in concrete structure, grounded at top and bottom and grounded firmly to reinforcing approximately every 10 feet. Connect down leads to #4/0 buried ground grid before connecting to ground rod.
- J. Drawings indicate extent and general arrangement of lightning protection system and show location of grounds, cable coursing and air terminals. For each cable to ground (structural steel) pitchpots and wood nailing blocks will be provided under other Section. Lightning protection supplier shall supervise installation of same. For each penthouse roof, air terminals shall be installed and supported physically from inside of parapet above roof flashing, by lightning protection supplier.
- K. Furnish copper pitchpots for installation under Division 7 where cables penetrate roofing membrane.
- L. Bond to structural steel column with bonding plate within 6 feet of lighting rod. Connections shall be exothermically welded.
- M. Bond metallic objects within 6' to system with approved cable and fitting.
- N. System shall meet UL requirements for Master-Labeled lightning protection systems. Provide additional system components required.
- O. Manufacturer's:
 - 1. Heary Brother's Lightning Protection Company, Inc.

- 2. Boston Lightning Rod Company, Inc.
- 3. East Coast Lightning Equipment, Inc.
- 4. Approved equal.

2.32 FIRESTOPPING

- A. Provide asbestos-free firestopping material capable of maintaining an effective barrier against flame, gases, and temperature. Provide noncombustible firestopping that is nontoxic to human beings during installation or during fire conditions. Devices and equipment for firestopping service shall be UL FRD listed or FM P7825 approved for use with applicable construction, and penetrating items.
 - 1. Fire Hazard Classification: Material shall have a flame spread of 25 or less, a smoke developed rating of 50 or less when tested in accordance with UL 723 or UL listed and accepted.
 - 2. Firestopping Rating: Firestopping materials shall be UL FRD listed or FM P7825 approved for "F" and "T" ratings at least equal to fire-rating of fire wall or floor in which penetrated openings are to be protected, except that "F" and "T" ratings may be 3 hours for firestopping in through-penetrations of 4-hour fire rated wall or floor.

2.33 FIRE ALARM SYSTEM

- A. Alarm Operation
 - 1. Upon the alarm activation of any area smoke detector, heat detector, manual pull station, sprinkler waterflow duct smoke detector, the following functions shall automatically occur:
 - a. The system shall remain in the alarm mode until all initiating devices are reset and the fire alarm panel is manually reset and restored to normal.
 - b. The internal audible device shall sound at the control panel or command center.
 - c. Display the alarm event on the graphical workstation.
 - d. The LCD display shall indicate all applicable information associated with the alarm condition including; zone, device type, device location and time/date.
 - e. All system activity/events shall be documented on the system printer and logged into system history.
 - f. Any remote or local annunciator LCD/LED's associated with the alarm zone shall be illuminated.
 - g. Interface to the FM200 Halon System.
 - h. Activate notification audible appliances on the fire floors (zones) immediately above and below (adjacent to) the fire floor (zone) <general alarm evacuation>.
 - i. Activate visual strobes notification appliances on the fire floors (zones) immediately above and below (adjacent to) the fire floor (zone) <general alarm evacuation>. The visual strobe shall continue to flash until the system has

been reset. The visual strobe <shall> <shall not> not stop operating when the "Alarm Silence" is pressed.

- Or
- j. Sound the ANSI 117-1 signal with synchronized audibles and synchronized strobes throughout the facility.>
- k. Audible alarm signals shall be silenced from the fire alarm control panel by an alarm silence switch. Visual signals shall be programmable to flash until system reset or alarm silencing, as required.
- 1. The notification appliance dedicated to sprinkler system water flow alarm shall not be silenced while the sprinkler system is flowing at a rate of flow equal to a single head.
- m. Transmit signal to the building automation system.
- n. Transmit signal to the central monitoring station with point identification.
- o. Activate automatic smoke control sequences.
- p. Activate emergency lighting control.
- q. Activate emergency shutoffs for gas and fuel supplies.
- r. Activate emergency shutdown for the following equipment: <supply list of equipment to be shut down.>
- s. All automatic events programmed to the alarm point shall be executed and the associated outputs activated.
 - 1) Activation of elevator lobby or elevator equipment room smoke detectors shall initiate recall of the bank of elevators to the 1st floor and lockout the elevator controls. Activation of the first floor elevator lobby smoke detector shall recall shall be to an alternate floor, and lockout the elevator controls.
 - 2) Activation of heat detectors in elevator shafts and machine rooms shall activate the elevator power shunt trip circuit breaker.
- t. All stairwell/exit doors shall unlock throughout the building.
- u. All self-closing fire/smoke doors held open shall be released.
- v. Transmit alarm text messages to "alpha-numerical" display pagers.
- w. Direct the closed circuit TV cameras to the alarm event and start video recording.
- B. Supervisory Operation
 - 1. Upon supervisory activation of any sprinkler valve supervisory switch, waterflow duct smoke detector, guest unit smoke detector, guest unit CO detector, fire pump off-normal, clean agent fire suppression system trouble, elevator shunt trip supervision, the following functions shall automatically occur:
 - a. The internal supervisory event audible device shall sound at the control panel.
 - b. Display the event on the graphical workstation and display a pictorial image.
 - c. The LCD display shall indicate all applicable information associated with the supervisory condition including; zone, device type, device location and time/date.
 - d. All system activity/events shall be documented on the system printer and logged to system history.

- e. Any remote or local annunciator LCD/LED's associated with the supervisory zone shall be illuminated.
- f. Transmit signal to the central monitoring station with point identification.
- g. Activated Guest Unit smoke detectors shall be displayed individually at the fire alarm control unit and remote annunciator as a supervisory events. Activation of a Guest Unit smoke detector shall not sound the general fire alarm, but shall sound an audible alarm within the Guest Unit at all audible detector bases.
- h. Activated Guest Unit CO detectors shall be displayed individually at the fire alarm control unit and remote annunciator as supervisory events. Activation of a Guest Unit CO detector shall not sound the general fire alarm, but shall sound an audible alarm within the Guest Unit at all audible detector bases.
- C. Trouble Operation
 - 1. Upon activation of a trouble condition or signal from any device or internal system integrity monitoring function on the system, the following functions shall automatically occur:
 - a. The internal panel audible device shall sound at the control panel.
 - b. Display the event on the graphical workstation and display a pictorial image.
 - c. The LCD keypad display shall indicate all applicable information associated with the trouble condition including; zone, device type, device location and time/date.
 - d. Trouble conditions that have been restored to normal shall be automatically removed from the trouble display queue and not require operator intervention. This feature shall be software selectable and shall not prevent the logging of trouble events to the historical file.
 - e. All system activity/events shall be documented on the system printer and logged to system history.
 - f. Any remote or local annunciator LCD/LED's associated with the trouble zone shall be illuminated.
 - g. Transmit a trouble signal to the central monitoring station with point identification.
- D. Monitor Operation
 - 1. Upon activation of any device connected to a monitor circuit, the following functions shall automatically occur:
 - a. The internal panel audible device shall sound at the control panel.
 - b. Display the event on the graphical workstation and display a pictorial image.
 - 2. The LCD display shall indicate all applicable information associated with the status condition including; zone, device type, device location and time/date.
 - a. All system activity/events shall be documented on the system printer and logged to system history.

- b. Any remote or local annunciator LCD/LED's associated with the monitor circuit shall be illuminated.
- E. Fire Suppression System Interface
 - 1. Smoke detection within the hazard area shall be provided by a grid of multi-sensor smoke detectors installed on 20 foot centers. Activation of the first detector in the grid shall activate the "first detector" functions described below and condition the adjacent detectors in the grid to begin the release sequence, if activated. Activation of any adjacent detector shall start the "confirmation sequence" below.
 - 2. Cross-Zone alternate to above paragraph Smoke detection within the hazard area shall be provided by grid of alternating photoelectric detectors installed on 20 foot centers. Activation of any detector in the grid shall activate the "first detector" functions described below. Activation of a detector of a different type from the first detector activated shall start the "confirmation sequence" below.
 - 3. Provide an automatic extinguishing agent release interface modules at the locations shown on the drawings. The releasing interface shall be suitable for controlling the release of extinguishing agents such as FM-200®, Inergen®, CO2, or Halon®, as well as sprinkler pre-action or deluge systems furnished by others.
 - 4. Each interface shall provide supervised connections for: two agent release solenoid valves, two supervised pre-release notification circuits, a supervised manual release circuit, and a supervised abort switch circuit.
 - 5. Upon operation of the "first detector" associated with the protected area the system shall:
 - a. Activate fire alarm system
 - b. Display activated initiating device on graphic annunciator.
 - c. Activate visual pre-discharge notification appliances in protected area
 - d. Pulse the audible discharge notification appliances in the protected area
 - e. Release door holders and fire/smoke dampers
 - f. Shut down HVAC system supplying protected area
 - g. Shut down customer specified equipment in protected area
 - 6. Upon confirmation of the alarm by a "second detector," the system shall:
 - a. Display second activated initiating device on graphic annunciator
 - b. Start the automatic discharge delay timer (selectable from 0 to 60 seconds in 10 sec. increments)
 - c. Cause the audible discharge notification appliances in the protected area audible to sound continuously 10 seconds before agent release.
 - d. Activate the agent release solenoids at the expiration of the automatic discharge delay timer.
 - 7. Upon activation of the manual agent release station the system shall:
 - a. Activate fire alarm system
 - b. Display activated initiating device on graphic annunciator.
 - c. Activate visual pre-discharge notification appliances in protected area
 - d. Pulse the audible discharge notification appliances in the protected area

- e. Release door holders and fire/smoke dampers
- f. Shut down HVAC system supplying protected area
- g. Shut down <customer specified equipment> in protected area
- h. Start the manual discharge delay timer (selectable from 0 to 30 seconds in 10 sec. increments)
- i. Cause the audible discharge notification appliances in the protected area audible to sound continuously 10 seconds before agent release.
- j. Activate the agent release solenoids at the expiration of the automatic discharge delay timer.
- 8. System Abort
 - a. Select appropriate abort mode
 - b. If the abort switch is activated before the automatic discharge delay expires, the system will prevent agent release, however the automatic release delay timer will continue to run while the abort switch is active. When the abort switch is restored, agent release will occur upon expiration of the automatic delay timer or the abort delay timer (selectable for 0 or 10 seconds), whichever occurs last.>
 - c. If the abort switch is initiated before the automatic discharge delay expires, the system will prevent agent release and the automatic delay timer will stop. When the abort switch is restored, the automatic delay timer will resume from the stop point and agent release will occur with the expiration of the timer.>
 - d. The abort switch must be active when the second or confirmation alarm indication is received in order to abort agent release. When the abort switch is restored, the release will occur with the expiration of the 10 second abort delay timer. (Industrial Risk Insurers (IRI) Mode)>
 - e. If the abort switch is initiated before the automatic discharge delay timer expires, the system will prevent agent release and the automatic discharge delay timer will stop. When the abort switch is restored, the automatic discharge delay timer will reset and restart at t = 0. Agent release will occur with the expiration of the timer setting less 10 seconds.

F. General – EST Fire 3X

- 1. Overview
 - a. All materials, equipment, accessories, devices and other facilities and appurtenances covered by these specifications or noted on the drawings shall be new, best suited for the intended use and shall conform to applicable and recognized standards for their use, and supplied by a single manufacturer. Should any equipment provided under this specification be supplied by a different manufacturer, that equipment shall be recognized compatible by BOTH manufacturers and listed as such as required by Underwriters' Laboratories.
 - b. The fire alarm control panel(s) shall be a multi-processor based networked system designed specifically for fire, one-way emergency audio communications, smoke control, <extinguishing agent releasing system>, and guard patrol applications. The control panel shall be listed and approved for

the application standard(s) as listed in the References section of this specification.

- c. The control panel shall include all required hardware, software and site specific system programming to provide a complete and operational system. The control panel(s) shall be designed such that interactions between any applications can be configured, and modified using software provided by the manufacturer. The control panel(s) operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel.
- d. The operating controls shall be located in a steel enclosure behind a locked door with viewing window. All control modules shall be labeled, and all zone locations shall be identified. All panel modules shall be placement supervised for and signal a trouble if damaged or removed.
- 2. System Features
 - a. Each control panel shall include the following capabilities:
 - 1) Supervision of the system electronics, wiring, detection devices and software
 - 2) Up to 1500 analog/addressable input/output points
 - 3) Network connections with up to 8 other control panels.
 - 4) Support multiple dialers (DACTs) and modems
 - 5) An RS-232 serial communication port
 - 6) An internal audible signal with different patterns to distinguish between alarm, supervisory, trouble and monitor events
 - 7) Support four 24 VDC and eight channel Audio NACs
 - 8) NACs
 - 9) User configurable switches and LED indicators to support auxiliary functions
 - 10) Log up to 1100 chronological events
 - 11) The ability to download all applications and firmware from the configuration computer at a single location on the fire network
 - 12) A real-time clock for time stamps and timed event control
 - 13) Electronic addressing of intelligent addressable devices
 - 14) Provide an independent hardware watchdog to supervise software and CPU operation
 - 15) "Dry" alarm, trouble and supervisory relay contacts
 - 16) An optional 10/100 Base-T Ethernet port for network programming, diagnostics and monitoring.
 - 17) Control panel modules shall plug in to a chassis assembly for ease of maintenance
 - 18) Field wiring shall connect to the panel using removable connectors
- 3. User Oriented Features
 - a. Each control panel shall include the following user oriented features:
 - 1) An LCD user interface control/display that shall annunciate and control system functions.

- 2) Provide discreet system control switches for reset, alarm silence, panel silence, and acknowledge.
- 3) A Rotary Control shall be provided to simplify scrolling through the display and entering data.
- 4) A "lamp test" feature shall verify operation of all visual indicators on the panel.
- 5) An authorized user shall have the ability to operate or modify system functions including system time, date, passwords, holiday dates, restart the system and clear control panel event history file.
- 6) An authorized user shall have the ability to disable/enable devices, zones, actions, timers and sequences.
- 7) An authorized user shall have the ability to activate/restore outputs, actions, sequences, and simulate detector smoke levels.
- 8) An authorized user shall have the ability to enter time and date, reconfigure an external port for download programming, initiate programming and change passwords.
- b. An authorized user shall have the ability to test the functions of the installed system.
- c. Service groups shall facilitate one-man walk testing. Service/test groups shall be capable of being configured with any combination of addressable devices, independent of SLC wiring. It shall be possible to program alternate device responses when the device's service group is active. Devices not in an active service group shall process all events normally.
- d. Provide internal system diagnostics and maintenance user interface controls to display/report the power, communication, and general status of specific panel components, detectors, and modules.
- e. SLC loop controller diagnostics shall identify common alarm, trouble, ground fault, Class A fault, and map faults. Map faults include wire changes, device type changes by location, device additions/deletions and conventional open, short, and ground conditions. Ground faults on the supervised circuit wiring of remote addressable modules shall be identified by device address.
- f. An authorized user shall have the ability to generate a report history for alarm, supervisory, monitor, trouble, smoke verification, watchdog, and restore activity.
- g. System reports shall provide detailed description of the status of system parameters for corrective action or for preventative maintenance programs. Reports shall be displayed by the operator interface or capable of being printed on a printer.
- h. An authorized user shall have the ability to display/report the condition of addressable analog detectors. Reports shall include device address, device type, percent obscuration, and maintenance indication. The maintenance indication shall provide the user with a measure of contamination of a device upon which cleaning decisions can be made.
- 4. Programmability
 - a. A Windows-based Configuration Utility (CU) shall be used to create the sitespecific system programming. The utility shall facilitate programming of any

input point to any output point. The utility shall allow customization of fundamental system operations using initiating events to start actions, timers, sequences and logical algorithms.

- 1) Zoning of initiation devices.
- 2) Initiation of events by time of day, day of week, day of year.
- 3) Initiation of events by matrix groups (X-Y coordinate relationships) for releasing systems.
- 4) Initiation of events using OR, AND, NOT and counting functions.
- 5) Prioritizing system events.
- 6) Programmable activation of detector sounder bases by detector, groups of bases, or all bases.
- 7) Directing selected device messages to specific panel annunciators
- 8) Detector sensitivity selection by time of day
- 9) Support of 256 Central Monitoring Station accounts and directing selected device messages to any one of ten Central Monitoring Stations.
- b. The configuration utility shall time and date stamp all changes to the sitespecific program, and shall facilitate program versioning and shall store all previous program version data. The utility shall provide a compare feature to identify the differences between different versions of the site-specific program.
- c. The configuration utility shall be capable of generating reports which detail the configurations of all fire alarm panels, addressable devices and their configuration settings including generating electrical maps of the addressable device SLCs.
- d. The configuration utility shall support the use of bar code readers to expedite electronic addressing and custom programming functions.
 Please refer to the General, System Description Section for this project's site-specific system operating requirements.
- e. The fire alarm control panel shall be an Edwards EST3X.
- G. Power Supply
 - 1. System power supply(s) shall be a high efficiency switched mode design providing four (4) supervised power limited 24 VDC output circuits as required by the panel and external loads fed by the panel. Initial power supply loading shall not exceed 80% of power supply capacity in order to allow for future system expansion.
 - 2. Each system power supply shall be individually supervised. Power supply trouble signals shall identify the specific supply and the nature of the trouble condition.
 - 3. Upon failure of normal (AC) power, the affected portion(s) of the system shall automatically switch over to secondary power without losing any system functionality. When powered from batteries, the power supply shall employ "Voltage Boost" technology to insure that output voltage never drops below 22.5 VDC regardless of battery voltage.
 - 4. All system power supplies shall be capable of recharging their associated batteries, from a fully discharged condition to a capacity sufficient to allow the system to perform consistent with the requirements of this section, in 48 hours maximum.
 - 5. All standby batteries shall be continuously monitored by the power supply. The power supply shall be able to perform an automatic test of batteries and indicate a

trouble condition if the batteries fall outside a predetermined range. Power supplies shall incorporate the ability to adjust the charge rate of batteries based on ambient temperatures. The power supply shall automatically disconnect the battery before low voltage damages the battery. Low battery and disconnection of battery power supply conditions shall immediately annunciated as battery trouble.

- 6. Batteries shall utilize sealed lead acid chemistry. Initial battery capacity shall provide 125% of calculated capacity requirements in order to allow for future system expansion.
- 7. All AC power connections shall be to the building's designated emergency electrical power circuit and shall meet the requirements of NFPA 70 and NFPA 72. The power circuit disconnect means shall be clearly labeled FIRE ALARM CIRCUIT CONTROL and shall have a red marking. The location of the circuit disconnect shall be labeled permanently inside the each control panel the disconnect serves.
- 8. The power supply shall be an Edwards PS10-4B.
- H. User Interface
 - 1. Panel LCD and Common Controls 3X
 - a. The system shall be designed and equipped to receive, monitor, and annunciate signals from devices and circuits installed throughout the facility.
 - b. Each fire alarm control panel (system node) shall be capable of supporting a backlit LCD display. The display on each system node shall be configurable to display the status of any and/or all combinations of all alarm, supervisory, trouble, monitor, or service group event messages on the network. Each LCD display on the system shall be capable of being programmed to allow control functions of any combination of nodes on the entire network.
 - c. The LCD display shall provide separate alarm, trouble, supervisory, and monitor event queues of to minimize operator confusion. Receipt of alarm, trouble, and supervisory signals shall activate integral audible devices at the control panel(s) and at each remote annunciation device. The integral audible devices shall produce a sound output upon activation of not less than 85 dBA at 10 feet.
 - d. The LCD display shall contain the following system status indicators:
 - 1) System Power Indicator
 - 2) System CPU Fail Indicator
 - 3) Ground Fault Indicator
 - 4) Disabled Points Indicator
 - 5) System Common Alarm Indicator
 - 6) System Common Trouble Indicator
 - 7) System Common Supervisory Indicator
 - e. The LCD display shall contain the following system switch/indicators:
 - 1) System Reset Switch with Indicator
 - 2) System Alarm Silence Switch with Indicator
 - 3) System Panel Silence Switch with Indicator
 - 4) Acknowledge Switch with Indicator

- f. The LCD display shall contain the following system function control:
 - 1) Rotary Controller/Switch to scroll through the display and enter data.
- g. 960 Character Backlit Liquid Crystal Text Display
 - 1) The user interface shall provide a backlit LCD that will allow custom event messages of up to 42 characters. The interface shall provide a minimum of 24 lines by 40 characters and provide the emergency user hands free viewing of the first seven (7) and last highest priority events. The last highest priority event shall always display and update automatically. Events shall be automatically placed in one of four queues: alarm, trouble, supervisory and monitor. The total number of active events by type shall be displayed. Visual indication shall be provided of any event type that has not been acknowledged. It shall be possible to customize the designation of all user interface LEDs and Switches for local language requirements.
 - 2) Instructional text messages support a maximum of 2,000 characters each.
 - 3) The system 960 character LCD display shall be an Edwards 4X-LCD
- 2. LEDs and Switches
 - a. A modular series of switches and LED indicators shall be available to customize the fire alarm control panel operation in accordance with this specification. All LED and switch functions shall be software programmable. Switches shall be configurable for momentary, maintained, toggle, or "exclusive or" operation as required by the application. LEDs shall be configurable for slow flash, fast flash or steady operation. LED/Switch modules shall be capable of mounting in any available fire panel module position. All LED/Switch modules shall be supervised. LEDs shall be available in a variety of colors to facilitate identification from a distance. The LED/Switch modules shall provide ample room for custom function text labels under a protective membrane.
 - b. The LED/Switch modules shall be Edwards 3-24x series, 3-12xx series, and 3-6/3S1xxx series devices.
- 3. System Printer
 - a. The event and status printer shall be a 9-pin, impact, dot matrix printer with a minimum print speed of 232 characters per second. The printer shall be capable of serial or parallel communications protocol. The communications speed for RS-232 communications protocol shall be adjustable from 300 to 9600 Baud.
 - b. The printer output shall include the type of event, the circuit or device reporting including address, date, and event time. Event restoral conditions shall also be printed, including address, date, and event time.

- c. In the event that the printer is off-line when an event is received, a panel buffer shall retain the data and it shall be printed when the printer is restored to service.
- d. The system printer shall be an Edwards PT-1S.
- 4. Reports
 - a. The system shall provide the operator with system reports that give detailed description of the status of system parameters for corrective action, or for preventative maintenance programs. The system shall provide these reports via the main LCD, and shall be capable of being printed on any system printer.
 - b. The system shall provide a report that gives a sensitivity listing of all detectors that have less than 80% environmental compensation remaining. The system shall provide a report that provides a sensitivity (% Obscuration per foot) listing of any particular detector.
 - c. When addressable CO detectors are installed, performing a "sensitivity" check from the panel shall report the approximate number months of sensor life remaining.
 - d. The system shall provide a report that gives a listing of the sensitivity of all of the detectors on any given panel in the system, or any given analog/addressable device loop within any given panel.
 - e. The system shall provide a report that gives a chronological listing of at least the last 1000 system events.
 - f. The system shall provide a listing of all of the firmware revision listings for all of the installed components in the system.
- I. Signaling Line Circuits
 - 1. Fire Network Wiring
 - a. The network inter panel wiring shall be Class A . The network media shall be copper except where fiber optic cable is specified on the drawings.
 - b. The system supplied under this specification shall utilize node to node, direct wired peer-to-peer network operations. The system shall utilize independently addressed, smoke detectors, heat detectors and input/output modules intrusion detection as described in this specification. The peer-to-peer network shall contain multiple nodes consisting of the command center, main controller, remote control panels, LCD/LED annunciation nodes, and workstations. Each node is an equal, active functional node of the network, which is capable of making all local decisions and generating network tasks to other nodes in the event of node failure or communications failure between nodes.
 - c. When a network is wired in a Class B configuration, a single break or short on the network wiring isolates the system into two groups of panels. Each group continues to function as a peer-to-peer network working with their combined databases. When wired using a Class A configuration, a single break or short on the network wiring causes the system to isolate the fault, and network communication continues uninterrupted, without any loss of function. Should multiple wiring faults occur, the network re-configures into many sub-

networks and continues to respond to alarm events from every panel that can transmit and receive network messages.

- d. The copper network interface shall be an Edwards 3X-NET(8) series.
- e. The fiber optic network interface shall be an Edwards 3X-FIB8 with single mode multi-mode fiber optic transceivers.
- 2. EST3X System
 - a. The signaling line circuit connecting panels/nodes to intelligent addressable devices including, detectors, monitor modules, control modules, isolation modules, intrusion detection modules and notification circuit modules shall be Class A (style 6 or 7) Class B (style 4). All signaling line circuits shall be supervised and power limited.
 - b. When the addressable devices on a signaling line circuit cover more than one designated fire/smoke compartment, a wire-to-wire short on the circuit shall not affect the operation of the addressable devices in other fire/smoke compartments.
 - c. Each SLC shall support 125 addressable detector addresses and 125 module addresses. The SLC shall support 100% of all addressable devices in alarm and provide support for a 100% compliment of detector isolator bases. Initial circuit loading shall not exceed 80% in order to allow for future system expansion.
 - d. T-taps (branching) shall be permitted on Class B circuits. Where possible, the devices installed at the end of each branch should be easily accessible for troubleshooting, e.g. a pull station at normal mounting height.
 - e. The addressable device SLC module shall be UL Listed for use with code compliant, electrically sound existing wiring.
 - f. Each intelligent addressable device shall transmit information about its location with respect to other devices on the circuit. This information shall be used to create an "As-Built" wiring diagram as well as provide enhanced supervision of a device's physical location. The device message and programmed system output function shall be associated with the device's location on the SLC circuit location and not a device address.
 - g. The SLC module shall allow replacement of "same type" devices without the need to address and reload the "location" parameters on replacement device.
 - h. The SLC/Panels shall notify the user when programmed devices are detected on the SLC circuit. The SLC/Panels shall notify the user when the wrong device type is installed at a location configured for a different device type on the SLC circuit.
 - i. The addressable device signaling line circuit module shall be an Edwards XAL250 series.
- J. Notification Appliance Circuits
 - 1. Notification Appliance Circuits 3X
 - a. General All notification circuits shall be supervised and power limited. Nonpower limited circuits are not acceptable. All notification appliance circuits shall be Class A (Style "Z") Class B (Style "Y").
- b. Initial circuit loading shall not exceed 80% in order to allow for future system expansion.
- c. 24 VDC Notification Appliance circuits
 - 1) Notification appliance circuits shall utilize a "voltage boost" circuit to insure FACP terminal voltage never drops below 22.5VDC even under low battery conditions.
 - 2) Notification appliance circuits shall have a minimum circuit output rating of 3 amps @ 24 VDC
 - 3) 24VDC NACs shall be polarized and provide both strobe synchronization and a horn silence signals on a single pair of wires.
- d. Audio Notification Appliance Circuits
 - 1) Audio notification appliance circuits shall be polarized and have a minimum circuit output rating of 50 watts @ 25V audio, and 35 watts @ 70V audio.
- K. Initiating Device Circuits
 - 1. Conventional (2-wire) initiating device circuits monitoring manual fire alarm stations, smoke and heat detectors, waterflow switches, valve supervisory switches, fire pump functions, and air pressure supervisory switches shall be Class A (Style "D" or "E") Class B (Style "A" or "B").
 - 2. Initiating device circuits monitoring magnetic security contacts, motion detectors, duress station, glass break and intrusion type devices shall be Class B (Style "A" or "B").
 - 3. Initiating device circuits shall be configurable for latched or non-latched operation and configurable to initiate alarm, supervisory or monitor events.
 - 4. End-of-line resistors for conventional initiating device circuits shall be covered with insulated tubing, terminated with ring lugs and display a UL label.
- L. Off Premises Communications
 - 1. DACT
 - a. The system shall provide off premises communications capability using a Digital Alarm Communications Transmitter (DACT) for sending system events to multiple Central Monitoring Station (CMS) receivers over conventional telephone lines.
 - b. The system shall provide the CMS(s) with point identification of system events using 4/2, Contact ID ID (SIA DC-05) or SIA DCS protocols. The system shall also transmit an alphanumeric system activity message, by event, to a commercial paging system provided by the owner, using TAP Pager protocol and an internal V.32BIS or greater 14.4Kbaud modem.
 - c. The dialer shall support up to 255 individual accounts and to send account information to eight (8) different receivers, each having a primary and secondary telephone access number. System events shall be capable of being

directed to one or more receivers depending on event type or location as specified by the system design.

- d. In the event of a fire alarm panel CPU failure during a fire alarm condition, the DACT degrade mode shall transmit a general fire alarm signal to the CMS.
- e. The owner shall arrange for two (2) dedicated loop-start phone lines to be terminated using two RJ31X jacks within 5 ft of the main fire alarm control panel.
- f. The DACT shall be an Edwards 3-MODCOM(P).
- M. Remote Booster Power Supply
 - 1. Install Remote NAC Power Supplies (boosters) at the locations shown on the drawings, as required, to minimize NAC voltage drops. Remote NAC power supplies shall be treated as peripheral NAC devices and shall not be considered fire alarm control units.
 - 2. The NAC power supplies shall be fully enclosed in a surface mounted steel enclosure with hinged door and cylinder lock, and finished in red enamel. Door keys shall be the identical to FACP enclosure keys. The enclosure shall have factory installed mounting brackets for additional UL listed fire alarm equipment within its cabinet. Enclosures shall be sized to allow ample space for interconnection of all components and field wiring, and up to 10AH batteries. The enclosure shall have provisions for an optional tamper switch. All FACP addressable control modules required to initiate the required NAC power supply output functions shall be installed within the NAC power supply enclosure
 - 3. Remote NAC power supply input circuits shall be configurable as Class B supervised inputs or for connection to any 6 to 45 VDC initiation source.
 - 4. Remote booster power supplies shall provide four (4) synchronized Class B supervised or two (2) Class A, power limited, 24VDC filtered and regulated Notification Appliance Circuits (NACs). Each NAC output shall be configurable as a continuous 24Vdc auxiliary power output circuit. The booster power supply shall be capable of a total output of <6> 10 amps.
 - 5. The power supply NACs shall be configurable to operate independently at any one of the following rates: continuous synchronized, or 3-3-3 temporal. It shall be possible to configure the NACs to follow the main FACP NAC or activate from intelligent addressable synchronized modules. All visible <audible> NACs within the facility shall be synchronized.
 - 6. Upon failure of primary AC power, the remote power supply shall automatically switch over to secondary battery power without losing any system functions. It shall be possible to delay reporting of an AC power failure for up to 6 hours. All standby batteries shall be continuously monitored by the power supply. Low battery and disconnection of battery power supply conditions shall immediately annunciated as locally as battery trouble. All power supply trouble conditions (DC power failure, ground faults, low batteries, and IDC/NAC circuit faults) shall identify the specific remote power supply affected at the main FACP. All power supply trouble conditions except loss of AC power shall report immediately. Interconnecting NAC Booster power supplies in a manner which prevents identification of an individual power supply trouble shall not be considered as an equal.
 - 7. The remote booster power supply shall be capable of recharging up to 24AH batteries to 70% capacity in 24 hours maximum. Batteries provided shall be sized to meet the

same power supply performance requirements as the main FACP, as detailed elsewhere in this specification.

- 8. All AC power connections shall be to the building's designated dedicated emergency electrical power circuit. The power circuit disconnect means shall be clearly labeled FIRE ALARM CIRCUIT CONTROL and shall have a red marking. The location of the circuit disconnect shall be labeled permanently inside the each remote NAC power supply the disconnect serves.
- 9. The remote NAC power supplies shall be Edwards model BPS/APS series devices.
- N. Peripheral Components
 - 1. Addressable Detectors
 - a. General Requirements for Intelligent Addressable Heat, Smoke and CO Detectors
 - b. Each detector shall contain an integral microprocessor which shall determine if the device is normal, in alarm, or has an internal trouble. The microprocessor's non-volatile memory shall permanently store the detector's serial number, device type and system address. It shall be possible to address each intelligent device without the use of switches. Devices requiring switches for addressing shall not be considered as equal. Memory shall automatically be updated with the hours of operation, last maintenance date, number of alarms and troubles, time of last alarm, and analog signal patterns for each sensing element just before the last alarm.
 - c. Each detector shall be capable of identifying up to 32 diagnostic codes. This information shall be available for system maintenance. The diagnostic code shall be stored at the detector.
 - d. Each addressable detector on the Signaling Line Circuit (SLC) shall transmit information regarding its location with respect to other intelligent devices on the signaling line circuit to the control panel, creating an "As-Built" circuit map. The circuit mapping function shall provide location supervision of all intelligent devices on the signaling line circuit. An intelligent detector's programmed system response functions shall be associated with the detector's actual location on the signaling line circuit and not with the detector's address. After system commissioning, detectors improperly installed in the wrong location shall function according to the mapped programmed response for its location on the circuit, not its detector's address.
 - e. Two status LEDs shall be provided on each detector. A flashing green LED shall indicate normal operation; flashing RED shall indicate the alarm state. A steady RED and steady GREEN shall indicate alarm state when in the standalone mode. LEDs shall be visible from any direction.
 - f. The system shall allow for changing of detector types for service replacement purposes without the need to reprogram the system. The replacement detector type shall automatically continue to operate with the same programmed sensitivity levels and functions as the detector it replaced, without the need for reprogramming. System shall display an off-normal condition until the proper detector type is installed or a change in the device type profile has been made.
 - g. Detectors shall be rated for operation in the following environment unless specifically noted:

- 1) Temperature: 32° F to 120° F (0° C to 49° C)
- 2) Humidity: 0-93% RH, non-condensing
- h. Detectors with addressing components in the base shall not be considered as equal.
- i. The intelligent detectors shall be Edwards Signature Series devices.
- j. Please refer to the General, System Description Section for site-specific detector operating requirements.
- 2. Photo CO
 - a. Provide analog/addressable combination photoelectric smoke and carbon monoxide (CO) detectors at the locations shown on the drawings.
 - b. The combination smoke and CO detector shall provide two independent signals (smoke & CO) to the control panel for programming system responses. When mounted in a sounder base, the detector shall be capable of initiating a temporal 3-3-3 when smoke is detected or temporal 4-4-4-4 when CO is detected. Detectors that transmit a common signal to the control panel for both smoke and CO alarms shall not be considered as equals. The detector shall be listed under standards UL-268 and UL-2075.
 - c. Each smoke detector shall be individually programmable to operate at any one of five (5) sensitivity settings. The detector shall also store pre-alarm and alternate pre-alarm sensitivity settings. Pre alarm sensitivity values shall be configurable in 5% increments of the alarm and alternate alarm sensitivity settings respectively. The detector shall be able to differentiate between a long term drift above the pre alarm threshold and fast rise above the threshold. The detector shall monitor the sensitivity of the smoke sensor. If the sensitivity shifts outside the UL limits, a trouble signal shall be sent to the panel. It shall be possible to automatically change the sensitivity of individual intelligent addressable smoke detectors for day and night (alternate) periods.
 - d. Each detector shall utilize an environmental compensation algorithm that shall automatically adjust for background environmental conditions such as dust, temperature, and pressure. The detector shall provide a maintenance alert signal when 80% (dirty) of the available compensation range has been used. The detector shall provide a dirty fault signal when 100% or greater compensation has been used.
 - e. The smoke chamber shall be UL listed for field replacement.
 - f. The electro-chemical CO sensor shall generate a CO alarm in compliance with UL-2034 requirements. The sensor shall have a nominal six-year life. When the sensor approaches the end of its useful life, it shall transmit a maintenance condition to the control panel, indicating the CO sensor board replacement is required. Only when the sensor is no longer operational shall a trouble condition be sent to the control panel. Sensors that transmit a common trouble indication for both sensor end-of-life and other causes of detector trouble shall not be considered as equal. Performing a "sensitivity" check from the panel shall report the approximate number months of CO sensor life remaining.
 - g. Placing the CO detector in test mode shall facilitate the use of direct injection of small quantities of CO to check detector functionality. The CO sensor board

shall be UL listed as field replaceable. Replacement of the CO sensor shall not require any field calibration.

- h. The Combination photoelectric smoke & CO detector shall be an Edwards SIGA2-PCOS.
- 3. Photoelectric
 - a. Provide analog/addressable photoelectric smoke detectors at the locations shown on the drawings.
 - b. When mounted in a sounder base, the detector shall initiate a temporal 3-3-3 when smoke is detected.
 - c. The photoelectric smoke detector shall be suitable for direct insertion into air ducts up to 3 ft (0.91m) high and 3 ft (0.91m) wide with air velocities up to 5,000 ft/min. (0-25.39 m/sec) without requiring specific duct detector housings or supply tubes.
 - d. Each smoke detector shall be individually programmable to operate at any one of five (5) sensitivity settings. The detector shall also store pre-alarm and alternate pre-alarm sensitivity settings. Pre alarm sensitivity values shall be configurable in 5% increments of the alarm and alternate alarm sensitivity settings respectively. The detector shall be able to differentiate between a long term drift above the pre alarm threshold and fast rise above the threshold. The detector shall monitor the sensitivity of the smoke sensor. If the sensitivity shifts outside the UL limits, a trouble signal shall be sent to the panel. It shall be possible to automatically change the sensitivity of individual intelligent addressable smoke detectors for day and night (alternate) periods.
 - e. Each detector shall utilize an environmental compensation algorithm that shall automatically adjust for background environmental conditions such as dust, temperature, and pressure. The detector shall provide a maintenance alert signal when 80% (dirty) of the available compensation range has been used. The detector shall provide a dirty fault signal when 100% or greater compensation has been used.
 - f. The photoelectric smoke detector shall be an Edwards SIGA-PS.
- 4. Duct Smoke
 - a. Provide intelligent low profile photoelectric duct smoke detectors / remote test switches at the locations shown on the drawings.
 - b. The intelligent duct smoke detector shall operate in ducts having from 100ft/min to 4,000ft/min air velocity. The detector shall be suitable for operation over a temperature range of -20 to 158F° and offer a harsh environment gasket option. The detector shall utilize an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten (10) feet. Design of the detector shall permit sampling tube installation from either side of the detector and permit sampling tube installation in 45- degree increments to ensure proper alignment with duct airflow. Drilling templates and gaskets to facilitate locating and mounting the housing shall be provided.
 - c. The intelligent duct smoke detector shall obtain information from a photoelectric sensing element. The detector shall be able to differentiate between a long term drift above the pre alarm threshold and fast rise above the

threshold. The detector shall monitor the sensitivity of the smoke sensor. If the sensitivity shifts outside the UL limits, a trouble signal shall be sent to the panel

- d. Each detector shall utilize an environmental compensation algorithm that shall automatically adjust for background environmental conditions such as dust, temperature, and pressure. The detector shall provide a maintenance alert signal when 80% (dirty) of the available compensation range has been used. The detector shall provide a dirty fault signal when 100% or greater compensation has been used.
- e. The intelligent duct smoke detector shall provide a form "C" auxiliary alarm relay rated at 2amps @ 30Vdc. The position of the relay contact shall be supervised by the control panel software. Operation of the relay shall be controlled either by its respective detector processor or under program control from the control panel as required by the application. Detector relays not capable of programmed operation independent of the detector's state shall not be considered as equal. The detector shall be equipped with a local magnet-activated test switch.
- f. Each duct detector shall be installed and testing in accordance with manufacturer's instructions, including pressure differential and, velocity testing. Test results shall be submitted to the owner.
- g. Remote test switches/LED indicators shall be provided below the detector on the ceiling to indicate location of the detector in non-mechanical areas, at locations indicated on the drawings.
- h. The Intelligent Photoelectric Duct Smoke Detector shall be an Edwards model SIGA-SD.
- i. The remote key operated test switch / LED shall be a Edwards model SD-TRK
- 5. Duct Mounting Plate
 - a. Where addressable smoke detectors are directly mounted on a low velocity ducts up to 3 ft (0.91m) high x 3 ft (0.91m) wide, provide factory mounting plate assemblies to facilitate mounting the detectors. The mounting plate shall be code gauge steel with corrosion resistant red enamel finish. The detector mounting plate shall support an addressable detector along with a standard, relay or isolator detector mounting base.
 - b. The detector mounting plate shall be an Edwards SIGA-DMP.
- 6. Standard Base
 - a. Provide standard detector bases suitable for mounting on either North American 1-gang, 3¹/₂ or 4 inch octagon box and 4 inch square box, European BESA or 1-gang box.
 - b. The bases shall utilize a twist-lock design and provide screw terminals for all field wiring connections.
 - c. The base shall contain no active electronics and support all Signature series detector types.
 - d. The base shall be capable of supporting a Remote Alarm LED Indicator. Provide remote LED alarm indicators where shown on the plans.

- e. Removal of the respective detector shall not affect communications with other detectors.
- f. The standard addressable detector base shall be an Edwards SIGA-SB or SB4.
- g. The remote LED indicator shall be an Edwards SIGA-LED
- 7. Relay Base
 - a. Provide relay detector bases suitable for mounting on either North American 1gang, 3¹/₂ or 4 inch octagon box and 4 inch square box, European BESA or 1gang box; at the locations shown on the drawings.
 - b. The bases shall utilize a twist-lock design and provide screw terminals for all field wiring connections.
 - c. The base shall contain no electronics and support all Signature series detector types.
 - d. Removal of the respective detector shall not affect communications with other detectors.
 - e. The relay base shall meet the following requirements:
 - 1) The relay shall be a bi-stable type and selectable for normally open or normally closed operation.
 - 2) The position of the relay contact shall be supervised.
 - 3) The operation of the base relay shall be configurable for control by its respective detector or for independent programmable control from the fire alarm panel. Relay bases not configurable for detector or panel operation shall not be considered equal.
 - 4) The base relay shall provide form "C" contacts with a minimum rating of 1 amp @ 30 Vdc and be listed for pilot duty.
 - f. The standard addressable relay detector base shall be an Edwards SIGA-RB or RB4
- 8. Sounder Base
 - a. Provide audible detector mounting bases suitable for mounting on a North American 1-gang, 3¹/₂ or 4 inch octagon box and 4 inch square box, or European BESA or 1-gang box; at the locations shown on the drawings.
 - b. The bases shall utilize a twist-lock design and provide screw terminals for all field wiring connections.
 - c. Removal of the respective detector shall not affect communications with other detectors.
 - d. The audible base shall support all detector types and shall be capable of single or group operation.
 - e. The audible base shall emit a temporal 3-3-3 fire alarm tone when smoke or heat has been detected. The audible base shall emit a temporal 4-4-4-4 CO alarm tone when CO has been detected. The outputs shall be configurable for low or high output by moving a reversible jumper. The system shall be UL2017 listed for dual signaling for this purpose.

- f. The audible bases shall provide a UL-268 reverberant room sound output of 90.8 dBA at 10ft (3m) for temporal 3-3-3 fire alarm and 84.1 dBA at 10 ft.(3m) for temporal 4-4-4 CO alarm.
- g. The detector sounder base shall be an Edwards SIGA-AB4GT.
- 9. Isolator Base
 - a. Provide isolator detector bases suitable for mounting on either North American 1-gang, 3¹/₂ or 4 inch octagon box and 4 inch square box, European BESA or 1-gang box; at the locations shown on the drawings.
 - b. The bases shall utilize a twist-lock design and provide screw terminals for all field wiring connections.
 - c. The base shall support all Signature series detector types.
 - d. Isolator bases shall limit number of modules or detectors that may be rendered inoperative by short-circuit fault on SLC loop segment or branch. In the event the Class A signaling line circuit on which the isolator bases are installed is shorted, each base shall open the SLC. Isolator bases shall then sequentially reconnect the isolated circuit segments until only the segment with the short is left out of the circuit, leaving the balance of the circuit operational.
 - e. The Isolator Base shall be an Edwards SIGA-IB or SIGA-IB4.
- 10. Smoke Detector Guards
 - a. Smoke detector guards shall be installed at the locations shown on the drawings.
 - b. The guards shall be UL tested and listed by for use with the smoke detectors they protect. Guard design shall not affect the detector operating sensitivity and shall not reduce the listed detector spacing.
 - c. The design of the guard shall provide physical protection for the detector while preventing looped items from hanging on the guard when wall mounted or being threaded through the guard.
 - d. The guards shall be constructed of 16-gauge steel with a baked white finish to match the detectors. Tamperproof mounting hardware shall be provided.
 - e. The Smoke Detector Guards shall be Edwards SIGA-DG.
- 11. Manual Stations
 - a. Single Action Two Stage
 - b. Provide addressable single action, two stage fire alarm stations at the locations shown on the drawings.
 - c. The manual station shall be suitable for mounting on North American 2 ¹/₂ (64mm) deep 1-gang boxes and 1 ¹/₂ (38mm) deep 4 square boxes with 1-gang covers. If indicated as surface mounted, provide manufacturer's surface back box.
 - d. The fire alarm station shall be of metal construction, shall be finished in red with silver "PULL IN CASE OF FIRE" lettering, shall show visible indication of operation and incorporate an internal toggle switch for first stage alarm and key switch for second stage alarm.
 - e. The manual pull station will have an addressable module integral to the unit.

- f. Manual pull stations that initiated an alarm condition when opening the unit are not acceptable.
- g. The addressable single action two stage manual fire alarm station shall be an Edwards SIGA-270P
- 12. Guards
 - a. Provide manual pull station guards at the locations shown on the drawings.
 - b. The guard shall consist of a factory-fabricated clear polycarbonate enclosure, hinged at the top. Lifting the cover shall provide access to the manual pull station and activate an integral battery powered audible horn intended to discourage false alarms.
 - c. The manual pull station guards shall Edwards STI-1000 Series.
- 13. Modules
 - a. General
 - b. Intelligent addressable multifunction modules shall be provided at the locations shown on the drawings to provide the specific system input and output functions described by the operation section and functional matrix found elsewhere in this specification.
 - c. The operation of multifunction modules shall be software configurable at the site to meet operational conditions, and may be changed at any time by download changes from the control panel. The intelligent multifunction modules shall utilize electronic addressing. Modules using rotary or DIP switches, memory chips and / or jumpers for addressing shall not be considered as equal.
 - d. Each intelligent multifunction module on the Signaling Line Circuit (SLC) shall transmit information regarding its location with respect to other intelligent devices on the signaling line circuit to the control panel, creating an "As-Built" circuit map. The circuit mapping function shall provide location supervision of all intelligent devices on the signaling line circuit. An intelligent device's programmed system response functions shall be associated with the device's actual location on the signaling line circuit and not with the device's address. After system commissioning, devices improperly installed in the wrong location shall function according to the mapped programmed response for its location on the circuit, not its device address.
 - e. All input /output status decisions shall be made by the microprocessor within the module. Communications with a control panel shall not be required in order for the module to identify off-normal input/output conditions. Modules with supervised input or output circuits shall be capable of identifying ground fault conditions down to the module address level.
 - f. Each module shall be equipped with two (2) diagnostic indicators; a green LED to confirm communications and a red LED to display active status. LEDs shall be visible through the finished cover plate. The module shall be capable of storing a unique serial number and up to 24 diagnostic codes, hours of operation, number of alarms and troubles, and time of last alarm in its memory which can be retrieved for troubleshooting.
 - g. Modules shall be rated for operation in the following environment:

- 1) Temperature: 32° F to 120° F (0° C to 49° C)
- 2) Humidity: 0-93% RH, non-condensing
- h. Where multiple modules are mounted in close proximity to each other, plug-in modular versions of the modules and motherboards shall be available to minimize field wiring and facilitate troubleshooting.
- i. The addressable multifunction modules shall Edwards Signature Series devices.
- j. Please refer to the General, System Description Section for site-specific module operating requirements.
- 14. One Input Monitor
 - a. Provide addressable single input multifunction modules at the locations shown on the drawings.
 - b. The module shall be suitable for mounting on North American 2¹/₂" (64mm) deep 1-gang boxes and 1¹/₂" (38mm) deep 4" square boxes with 1-gang covers.
 - c. Each module shall provide one (1) supervised Class B input circuit configurable as one of the following "personalities."
 - 1) Normally-Open Alarm Latching (for alarm initiation applications)
 - 2) Normally-Open Alarm Delayed Latching (for waterflow switch applications)
 - 3) Normally-Open Active Non-Latching (for limit switch and monitor applications)
 - 4) Normally-Open Active Latching (for tamper switch and supervisory applications)
 - d. Each module shall identify and report by device address, ground faults and opens associated with its initiating device circuit, to the control panel. Single function modules or without individual ground fault detection identification capability shall not be considered as equal.
 - e. The Intelligent Single Input Module shall be an Edwards SIGA-CT1.
- 15. Two Input Monitor
 - a. Provide addressable dual input multifunction modules at the locations shown on the drawings.
 - b. The module shall be suitable for mounting on North American 2¹/₂" (64mm) deep 1-gang boxes and 1¹/₂" (38mm) deep 4" square boxes with 1-gang covers.
 - c. Each module shall provide two (2) supervised Class B input circuit configurable as one of the following "personalities."
 - 1) Normally-Open Alarm Latching (for alarm initiation applications)
 - 2) Normally-Open Alarm Delayed Latching (for waterflow switch applications)
 - 3) Normally-Open Active Non-Latching (for limit switch and monitor applications)

- 4) Normally-Open Active Latching (for tamper switch and supervisory applications)
- d. Each module shall identify and report by device address, ground faults and opens associated with its initiating device circuits, to the control panel. Single function modules or without individual ground fault detection identification capability shall not be considered as equal.
- e. The Addressable Dual Input Module shall be an Edwards SIGA-CT2.
- 16. Notification Circuit
 - a. Provide addressable notification appliance circuit modules at the locations shown on the drawings.
 - b. The module shall be suitable for mounting in North American 2 ¹/₂" (64mm) deep 2-gang boxes and 1 ¹/₂" (38mm) deep 4" square boxes with 2-gang covers, or European 100mm square boxes.
 - c. The addressable NAC module shall provide one (1) supervised Class B notification appliance circuit.
 - d. The NAC control module shall be configurable for the following operations:
 - 1) 24 VDC synchronized NAC circuit, 2 amps @ 24 VDC.
 - 2) Audio notification circuit 25Vrms @ 50 watts or 70 Vrms @ 35 watts
 - 3) Firefighter's Telephone control with ring tone
 - e. The addressable notification appliance circuit module shall be an Edwards SIGA-CC1(S) or MCC1(S)
- 17. Relay
 - a. Provide addressable control relay modules at the locations shown on the drawings.
 - b. The module shall be suitable for mounting on a North American 2 ¹/₂" (64mm) deep 1-gang box or 1 ¹/₂" (38mm) deep 4" square box with 1-gang covers.
 - c. The module shall provide one (1) form C dry relay contacts rated at 24Vdc @ 2 amps (pilot duty) to control external appliances or equipment. The position of the relay contact shall be confirmed by the system firmware. The relay coil shall be magnetically latched to reduce wiring and ensure 100% of the relays on the SLC can be energized at same time.
 - d. The addressable control relay module shall be an Edwards SIGA-CR or MCR.
- 18. Waterflow-Tamper
 - a. Provide addressable dual input waterflow / tamper modules at the locations shown on the drawings.
 - b. The module shall be suitable for mounting on North American 2¹/₂" (64mm) deep 1-gang boxes and 1¹/₂" (38mm) deep 4" square boxes with 1-gang covers.
 - c. Each module shall provide two (2) supervised Class B input circuit configured as:

- 1) Normally-Open Alarm Delayed Latching for waterflow switch applications.
- 2) Normally-Open Active Latching for tamper switch and supervisory applications.
- d. Each module shall identify and report by device address, ground faults and opens associated with its initiating device circuits, to the control panel. Modules or without individual ground fault detection identification capability shall not be considered as equal.
- e. The Addressable Dual Input Module shall an Edwards SIGA-WTM.
- 19. Isolation Module
 - a. Provide addressable isolator modules at the locations shown on the drawings.
 - b. The module shall be suitable for mounting on North American 2¹/₂" (64mm) deep 1-gang boxes and 1¹/₂" (38mm) deep 4" square boxes with 1-gang covers.
 - c. In the event the Class A signaling line circuit on which the intelligent isolator module is installed is shorted, each module shall open the SLC. Isolator modules shall then sequentially reconnect the isolated circuit segments until only the segment with the short is left out of the circuit, leaving the balance of the circuit operational.
 - d. SLC isolation shall be provided for each floor or protection zone of building.>
 - e. The addressable Isolator Module shall be an Edwards SIGA-IM.
- 20. Universal Modules
 - a. Provide intelligent universal Class A/B multifunction modules at the locations shown on the drawings.
 - b. The module shall be suitable for mounting on North American 2¹/₂" (64mm) deep 2-gang boxes and 1¹/₂" (38mm) deep 4" square boxes with 2-gang covers.
 - c. Each universal module shall be configurable as one of the following "personalities."
 - 1) Two (2) supervised Class B Normally-Open Alarm Latching. (for alarm initiation applications)
 - 2) Two (2) supervised Class B Normally-Open Alarm Delayed Latching. (for waterflow switch applications)
 - 3) Two (2) supervised Class B Normally-Open Active Non-Latching. (for limit switch and monitor applications)
 - 4) Two (2) supervised Class B Normally-Open Active Latching. (for tamper switch and supervisory applications)
 - 5) One (1) form "C" dry relay contact rated at 2 amps @ 24 Vdc. (for circuit control applications)
 - 6) One (1) supervised Class A Normally-Open Alarm Latching. . (for alarm initiation applications)
 - 7) One (1) supervised Class A Normally-Open Alarm Delayed Latching. . (for waterflow switch applications)
 - 8) One (1) supervised Class A Normally-Open Active Non-Latching. (for limit switch and monitor applications)

- 9) One (1) supervised Class A Normally-Open Active Latching. . (for tamper switch and supervisory applications)
- 10) One (1) supervised Class A 2-wire Smoke Alarm Non-Verified. (for alarm initiation applications)
- 11) One (1) supervised Class B 2-wire Smoke Alarm Non-Verified. (for alarm initiation applications)
- 12) One (1) supervised Class A 2-wire Smoke Alarm Verified (for alarm initiation applications)
- 13) One (1) supervised Class B 2-wire Smoke Alarm Verified(for alarm initiation applications)
- 14) One (1) supervised Class A Signal Circuit, 24Vdc @ 2A.(for occupant notification applications)
- 15) One (1) supervised Class B Signal Circuit, 24Vdc @ 2A. (for occupant notification applications)
- d. Each module shall identify and report ground faults, opens and shorts associated with its supervised input / output circuits, by device address, to the control panel. Single function modules or without individual ground fault detection identification capability shall not be considered as equal.
- e. The Universal Class A/B Module shall an Edwards SIGA-UM.
- 21. Suppression System
 - a. Provide automatic extinguishing agent release interface modules at the locations shown on the drawings.
 - b. The releasing interface shall be UL listed for release of clean extinguishing agents as well as preaction sprinkler and deluge systems.
 - c. Each agent release interface shall provide two supervised agent release circuits for connection to agent release solenoid valves, supervised visual and audible pre-release notification appliance circuits, a supervised manual release circuit, and a supervised abort switch circuit. The solenoid release circuits shall be provided with manual disconnect switches for system maintenance.
 - d. The interface shall provide all required release and abort timing functions. The automatic discharge delay timer shall be adjustable from 0 to 60 seconds in 10 second increments. The manual discharge delay timer shall be adjustable from 0 to 30 seconds in 10 second increments. The abort delay timer shall be adjustable for 0 or 10 seconds.
 - e. The Suppression System Releasing Module shall be an Edwards SIGA-REL.
- 22. Notification Appliances
 - a. General
 - b. All appliances supplied for the requirements of this specification shall be UL Listed for Fire Protective Service, and shall be capable of providing the "equivalent facilitation" which is allowed under the Americans with Disabilities Act Accessibilities Guidelines (ADA(AG)), and shall be UL 1971 Listed.
 - c. All appliances shall be of the same manufacturer as the fire alarm control panel specified to insure absolute compatibility between the appliances and the

control panels, and to insure that the application of the appliances are done in accordance with the single manufacturer's instructions.

- d. Any appliances that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purpose intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purpose intended.
- e. All strobes shall be provided with lens markings oriented for wall mounting. Exterior mounted devices shall be provided with a weatherproof backbox.
- f. All visual appliances shall be synchronized. Light and audible output levels shall be designed to meet ADA and NFPA requirements
- g. All notification appliances shall be <red><white> unless noted otherwise on the drawings.
- 23. Low Profile
 - a. Horns
 - b. Provide low profile wall mounted horns at the locations shown on the drawings.
 - c. Low profile horns shall mount in a North American 1-gang box, and protrude less than 1" from the finished wall. The word FIRE shall be prominently displayed on the housing.
 - d. The horns shall provide an audible output of 85 dBA at 10 ft. when measured in reverberation room per UL-464, and have a selectable steady or synchronized temporal (3-3-3) output pattern.
 - e. Horn power, horn silencing, and strobe synchronization shall be accomplished over a single pair of wires. In and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.
 - f. The horns shall be Edwards Genesis G1 Series.
- 24. Strobes
 - a. Provide low profile wall mounted strobes at the locations shown on the drawings.
 - b. Low profile strobes shall mount in a North American 1-gang box, and protrude less than 1" from the finished wall. The word FIRE <ALERT> shall be prominently displayed on the housing.
 - c. The strobe output shall be switch selectable as required by its application from the following available settings: 15cd, 30cd, 75cd & 110cd. Selected strobe rating shall be visible when the strobe is in its installed position. Amber lens strobes shall be available with outputs of 12/24/60/88cd. Light shall be evenly distributed throughout the required volume using cavity and mask "FullLight" technology to prevent hot spots. Strobes using specular reflectors shall not be considered as equal.
 - d. When multiple strobes are installed within view of each other, their outputs shall be synchronized within ten (10) milliseconds of each other for an indefinite period without the need for separate synchronization modules.

- e. Horn and strobe power, horn silencing, and strobe synchronization shall be accomplished over a single pair of wires. In and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.
- f. The strobes shall be Edwards Genesis G1 Series.
- 25. Horn-Strobes
 - a. Provide low profile wall mounted horn-strobes at the locations shown on the drawings.
 - b. Low profile horn-strobes shall mount in a North American 1-gang box, and protrude less than 1" from the finished wall. The word FIRE shall be prominently displayed on the housing. The word FIRE <ALERT> shall be prominently displayed on the housing.
 - c. The horn-strobe shall provide an audible output of 85 dBA at 10 ft. when measured in reverberation room per UL-464, and have a selectable steady or synchronized temporal (3-3-3) output pattern.
 - d. The strobe output shall be switch selectable as required by its application from the following available settings: 15cd, 30cd, 75cd & 110cd. Selected strobe rating shall be visible when the horn-strobe is in its installed position. Amber lens strobes shall be available with outputs of 12/24/60/88cd. Light shall be evenly distributed throughout the required volume using cavity and mask "FullLight" technology to prevent hot spots. Strobes using specular reflectors shall not be considered as equal.
 - e. When multiple strobes are installed within view of each other, their outputs shall be synchronized within ten (10) milliseconds of each other for an indefinite period without the need for separate synchronization modules.
 - f. Horn and strobe power, horn silencing, and strobe synchronization shall be accomplished over a single pair of wires. In and out screw terminals shall accommodate 18AWG to 12 AWG wiring and have captive hardware.
 - g. The horn-strobes shall be Edwards Genesis G1 Series.
- 26. Surge Suppression Devices
 - a. The system shall utilize the following electrical surge protection devices to prevent damage and nuisance alarms caused by nearby lightning strikes, stray currents, or voltage transients.
 - b. On the AC Input of all fire alarm panels, remote power supplies and HPSA sites: Transtector ACO100BWN3, Leviton OEM-120EFI, EFI HWM-120, Ditek DTK-120HW or DTK-120/240 CM. AC Surge protectors shall be installed at the electrical panel board feeding the fire alarm equipment. Excess lead length shall be trimmed. The branch circuit conductor shall be formed into a 5-10 turn 1" diameter tie-wrapped coil just downstream of the suppressor connection.
 - c. On each DC fire alarm circuit entering or leaving the building: Transtector TSP8601, Citel American B280 -24V, Edco P264 and P642, Ditek DTKxLVL series, or equal.
 - d. DC Surge protectors shall be installed on each required circuit at the point of entry into the building.

27. Inspection Bar Codes

- a. Inspection bar codes shall be installed on all initiating devices, addressable modules, annunciators, control panels and power supplies.
- b. Inspection bar codes used by the system must utilize Code 3 of 9 or other approved format, and contain a minimum of eight (8) digits that comprise a unique serial identifier within the Web-based Reporting System. There shall be no duplication of device ID numbers. The ID number shall be printed below the bar code for identification purposes.
- c. Inspection bar codes shall be limited in size to no more than 2" (5cm) in width, and 3/8" (2 cm), in height and shall include a Mylar® or other protective coating to protect the bar code from fading due to sunlight or exposure.
- d. Inspection bar codes shall be installed on each device in such a manner as to require that scanning of the bar code take place no further than 12" from the device during inspection.

2.34 CARBON MONOXIDE DETECTORS

- A. Provide carbon monoxide detectors, type as shown on the drawings.
 - 1. For detectors to be used with Fire Alarm Control Panels, provide Macurco, Cat. No. CM-15 or CM-15A. Detectors shall be listed to UL Standard 2075 and tested for UL Standard 2034. Detectors shall be surface mounted over a single gang electrical box, or flush mounted over a 4" x 4" or two gang box. Detectors shall contain a test and reset switch, solid state sensors, SPDT relay, rated 12-24 vdc, contain an 85 dBA buzzer.
 - 2. For stand alone detectors, hard wired to 120V AC, with battery back up, provide Firex, Cat. No. 10000 AC/DC. Detectors shall have internal true-test sensor diagnostics, monthly self-testing, front loading battery door, latching LED alarm indicator, smart quiet trigger alarm locator, low battery silencer, co reset, dust cover, compatible with smoke, heat and co alarms, ramp-up horn.
- B. Provide all necessary low-voltage or 120 volt wiring for a completely operational system.
- C. Test detectors for proper functionality.

2.35 WIRE BASKET CABLE TRAY

- A. The work covered under this section consists of the furnishing of all necessary materials, labor, supervision, equipment and services to install complete wire basket cabletray system as shown on the drawings.
- B. Wire basket cable tray system is defined to include, but are not limited to straight sections of continuous wire mesh, splices, field formed horizontal and vertical bends, tees, drop outs, supports and accessories. The system shall be a welded steel wire cable conveyance system consisting of flexible linear or module sections designed to support, but are not limited to fiber optic and voice/data telecommunication cables. Tray shall be constructed from cold rolled steel in accordance with ASTM A510 Wire shall be pre-galvanized prior to

fabrication, and plated in accordance with ASTM B633 SC2. Tray shall also be designed in such a way as to allow cables to enter or exit the tray in any direction at any point along the length of the tray while also allowing cables to be added or removed without modification or manipulation of the tray system, including hanging hardware.

- C. References
 - 1. The Wire Basket Cable Tray System shall meet ANSI/NFPA70, all ASTM, NEMA VE TIA, CSA, and IEC standards as they relate to the composed materials, finishes, general requirements installation practices, for Wire Basket/ Cable Tray Systems set forth by industry standards.
- D. Drawings
 - 1. The drawings, which constitute a part of these specifications, indicate the general route of the wire basket cable tray system. Data presented on these drawings is as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification of all dimensions, routing, etc., is required.
 - 2. Specifications and drawings are for assistance and guidance, but exact routing, locations, distances and levels will be governed by actual field conditions. Contractor is directed to make field surveys as part of his work prior to submitting system layout drawings.
- E. Submittals
 - 1. Submittal Drawings: Submit Product data and drawings of wire basket cabletray and accessories including straight sections, splice hardware, mounting accessories showing accurately scaled components. Drawings to verify UL / C-UL classifications
 - 2. Product Data: Submit manufacturer's data on wire tray sections and support system including, but not limited to, types, materials, finishes, loading information, fill rates and product dimensions.
- F. Quality Assurance
 - 1. NEC Compliance: Comply with NEC, as applicable to construction and installation of cable tray and cable channel systems (Article 318, NEC).
 - 2. NFPA Compliance Comply with NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance" pertaining to installation of cable tray systems.
- G. Delivery, Storage And Handling
 - 1. Deliver wire tray sections and accessories carefully to avoid breakage, bending and scoring finishes. Do not install damaged equipment.
 - 2. Store wire basket and accessories in original cartons and in clean dry space; protect from weather and construction traffic.
- H. Acceptable Manufacturers

- 1. Manufacturer: Subject to compliance with these specifications, wire basket tray systems to be installed shall be Hubbell "HBT" series.
- I. Wire Tray Sections And Components
 - 1. Provide wire basket of types and sizes indicated; with all required splicing and mounting hardware. Construct units with T-weld edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.
 - a. All straight section longitudinal wires shall be constructed with a continuous top wire safety edge. Safety edge must be T-welded on all tray sizes.
 - b. Wire basket crosswire to be constructed with shaped wire to provide flat surface for cable support, avoiding pressure points or cable strain. Round wire construction allowed per engineers approval.
 - 2. Materials and Finishes: Material and finish specifications for Carbon Steel Wire and Pre-Galvanized steel Wire are as follows:
 - a. Pre-galvanized Zinc: Straight section shall be made from pre-galvanized steel meeting the minimum mechanical properties of ASTM A 641. Material must be cleaned after fabrication to remove any soot, manufacturing residue/oils, or metallic particles.
 - b. Powder Coat: Straight sections shall be powder coated black with an average paint thickness of 1.2mils (30microns) to 3.0mils (75microns). Hubbell powder coat product is masked at splice points to allow conductive ground design; no field paint removal is required.
 - c. Stainless Steel: Straight sections and accessories shall be made from AISI Type 304L, 316L Stainless Steel (meeting the minimum mechanical properties of ASTM A 580).
 - d. Electro-Plated Zinc Galvanized (Post Plated) Made from Carbon Steel and plated to ASTM B 633, Type III, SC-1.
 - e. Black Oxide: Certain support accessories and miscellaneous hardware shall be manufactured with a black oxide finish in accordance with ASTM D 769.
 - 3. Wire basket shall be made of high strength steel wires and formed into a standard 2 inch by 4 inch wire mesh pattern with intersecting wires welded together. All mesh sections must have at least one bottom longitudinal wire along entire length of straight section.
 - 4. Wire basket sizes shall conform to the following nominal criteria:
 - a. Straight sections shall be furnished in standard 118 inch lengths or 142 inch length dependant on engineers/project specifications.
 - b. Wire diameter shall be 0.195" (5mm) minimum on all mesh sections up to 16 linear inches. Wire diameter line wire shall be 0.234" (6mm) minimum on all mesh sections in excess of 16 linear inches. Wire diameter shall be minimum size of 4.5mm on stainless steel.
 - c. Wire basket shall have a 2 inch usable loading depth by (4), (6), (8), (10), (12), (14), (16), (18), (20), (22), (24), (26), (28), (30), (32) inches wide.

- d. Wire basket shall have a 4 inch usable loading depth (4), (6), (8), (10), (12), (14), (16), (18), (20), (22), (24), (26), (28) inches wide.
- e. Wire basket shall have a 6 inch usable loading depth by (8), (10), (12), (14), (16), (18), (20), (22), (24) inches wide.
- f. Wire basket shall have an 8 inch usable loading depth by (8), (10), (12), (14), (16), (18), (20) inches wide.
- 5. All fittings shall be field formed, from straight sections, in accordance with manufacturer's instructions.
- 6. All Tray sections and splicing assemblies shall be UL/C-UL Classified as an Equipment Ground Conductor (EGC).
- 7. Special accessories shall be furnished as required to protect, support and install a wire basket support system either in a ceiling or raised access floor application.
- J. Installation
 - 1. Install wire basket as indicated; in accordance with recognized industry practices (NEMA VE-2 2000), to ensure that the cable tray equipment complies with requirements of NEC, and applicable portions of NFPA 70B and NECA's "Standards of Installation" pertaining to general electrical installation practices.
 - 2. Coordinate wire basket with other electrical work as necessary to properly interface installation of wire basket runway with other work.
 - 3. Provide sufficient space encompassing wire basket to permit access for installing and maintaining cables.
- K. Testing
 - 1. Test wire basket support systems to ensure electrical continuity of bonding and grounding connections, and to demonstrate compliance with specified maximum grounding resistance. See NFPA 70B, Chapter 18, for testing and test methods.

2.36 TELECOMMUNICATIONS (VOICE AND DATA)

- A. Summary
 - 1. These specifications and drawings describe the minimum requirements that must be met by the Contactor for all work as specified herein for the furnishing and installation of the Telecommunications (voice and data) cabling and associated hardware. Upon award of a contract for the work as described herein, the Contractor assumes all liability for a complete structured cabling system, including all quantities, materials, labor, project management, documentation, labeling and warranty of the work.
 - a. The Contractor will furnish and install the voice and data empty raceway system including boxes, conduit, cable tray, cable runway, grommets, pull rope, fittings and all associated hardware necessary to affect a workable and fully compliant raceway support system for voice, date, and video cable and as described in these specifications and in the drawings, and to the satisfaction of the Owner.

- b. The contractor is to furnish and install all horizontal distribution cabling and horizontal distribution cable terminations within each Telecommunication Room (IC) and Main Cross-connect room (MC) and Entrance facility/Demarc room (EF/Verizon Room) and as required herein and on the Contract Documents.
- c. The contractor is to furnish and install all riser backbone cabling and riser backbone cable terminations within each Telecommunication Room (IC) Main Cross-connect room (MC) and Entrance Facility room (EF) and as required herein and on the Contract Documents.
- d. The contractor is to furnish and install all interbuilding backbone cabling, raceway and terminations within and between the Johnson I and new addition as required herein and on the Contract Documents.
- e. The Contractor is responsible for labeling all cables at both ends of the cable and at termination hardware.
 - 1) The contractor will ensure that the faceplates are properly labeled and correlate exactly with the patch panel position labeling within the TR and MC/EF rooms.
 - 2) The contractor will ensure that wiring block and connector housing positions are properly labeled and correlate exactly with wiring block and connector housing positions at associated MC/EF/IC rooms.
 - 3) All faceplates, patch panels, connector housings, wiring blocks, racks and port/connector positions and pathway systems shall be labeled for a complete administration system.
- f. The contractor will furnish and install the complete structured cabling system and all associated hardware necessary to affect a tested and fully compliant working Cabling System as described in these specifications and in the drawings, and to the satisfaction or the Owner.
- 2. The Contractor shall label all cable at both ends at the communication outlets and cross-connects, in accordance with ANSI/EIA/TIA and as specified herein.
- 3. The Contractor shall test all copper cable and all fiber optic cable strands in accordance with ANSI/EIA/TIA and as specified herein.
- 4. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Provide all supplementary and miscellaneous items, appurtenances, devices and materials necessary for a sound secure and complete system installation.
- 5. The Contractor will furnish, install, terminate and test the telephone and data intrabuilding backbone and horizontal distribution systems cabling, panels, connectors, wiring blocks, connection blocks, patch cords and all other hardware necessary to effect a workable cable plant fully compliant with that as described in these specifications and in the drawings, and to the satisfaction of the Owner.
- 6. The specifications and drawings describe the minimum requirements that must be met by the Contractor for the installation of all work.
- 7. The work under this contract shall include all labor, materials, tools, equipment, transportation, insurance, temporary protection, supervision and incidental items essential for proper installation and operation, even though not specifically mentioned or indicated on the drawings, but which are usually provided or are

essential for proper installation and operation, of all systems as indicated on the drawings and specified herein.

- 8. The specifications and drawings describe the minimum requirements that must be met by the Contractor for installation of all work shown on the drawings and as specified herein under.
- 9. The following general systems and equipment shall be provided, as a minimum, for the new building, as a minimum but not necessarily limited to the following:
 - a. Provide complete intrabuilding backbone cabling system.
 - b. Provide complete interbuilding backbone cabling system.
 - c. Provide complete horizontal cabling system.
 - d. Provide complete horizontal cross-connects for voice infrastructure.
 - e. Provide complete horizontal cross-connects for data infrastructure.
 - f. Furnish patch cords and equipment interconnect cords.
 - g. Wiring blocks.
 - h. Connecting blocks.
 - i. Pathways and spaces (raceway, runway and conduit).
 - j. Grounding and bonding.
 - k. Cable management hardware.
 - 1. Equipment racks.
 - m. Patch panels.
 - n. Fiber optic innerduct.
 - o. Pull rope.
 - p. Velcro cable management.
 - q. Nameplates and labeling.
 - r. Fire seal and fire stopping.
 - s. Testing of all cable systems.
 - t. Supervision and approval.
 - u. Shop drawings.
 - v. As-built documentation.
- B. Related Work Specified Elsewhere
 - 1. For work to be included as part of this section, to be furnished and installed by the Contractor, refer to the following sections:
 - a. Installation of access panels by Trades as determined by the General Contractor
 - b. Cutting and patching in masonry
 - c. Finish painting
 - d. Fire Protection
 - e. Electrical Special Conditions
 - f. Basic Materials and Methods
 - g. Wiring Methods
 - h. Fire Stopping
 - i. Phasing
 - j. Submittals
 - k. Record Drawings
 - 1. Temporary Facilities

C. Equipment Allowances

- 1. In addition to all equipment indicated on the telecommunication drawings, the Contractor shall carry allowances to furnish and install the following equipment in locations to be determined:
 - a. Twenty (20) 4-port standard telecommunications outlets inclusive of conduit, back box faceplate, jack connectors, cable, patch panel(s), cable management and terminations as defined in the Construction Documents.

D. Submittals

- 1. Prepare and submit shop drawings in accordance with the requirements hereinbefore specified, and with the Shop Drawings, Product Data and Samples Section 01 0340 in the manner described therein, modified as noted hereinafter.
- 2. Submit manufacturers product and data sheets of all materials and systems to the Architect for approval, consisting of complete product description and specifications, complete performance test data, complete preparation and installation instructions, and all other pertinent technical data required for complete product and use information.
- 3. All shop drawings shall have clearly marked the appropriate specification number of drawing designation for identification of the submittal.
- 4. Disposition of shop drawings shall not relieve the Contractor from the responsibility for deviations from drawings or specifications unless he has submitted in writing, a letter itemizing or calling attention to such deviation at the time of submission and secured written approval from the Architect, nor shall such disposition of shop drawings relieve the Contractor from responsibility for errors in shop drawings or schedules.
- 5. The Contractor shall show proof of having a sufficient number of trained personnel on staff for all telephone and data systems, cabling, and connector installation as required by the specific manufacturer of equipment being provided for by the Contractor.
- 6. The Contractor shall show proof of membership in a certified cabling installation program and must warrant the cabling system specified herein for a minimum of 25 years.
- 7. Do not order materials or begin installation until written approval of submittals by the Architect has been obtained.
- 8. Submittals shall contain information specific to systems, equipment and materials required by Contract Documents for this project only. Do not submit catalogs that describe products, models, options or accessories other than those required, unless irrelevant information is marked out or unless relevant information is highlighted clearly.
- 9. Intent of Submittal review is to check for capacity, rating and certain construction features. Contractor shall ensure that work meets requirements of Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction and for coordination of work of this and other sections. Work shall comply with submittals marked "REVIEWED" to extent that they agree with Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination,

quantities, installation, wiring, supports and access for service, not the shop drawing errors or deviations from requirements or Contract Documents. The Architect's noting of some errors while overlooking others will not excuse the contractor from proceeding in error. Contract Documents requirements are not limited, waived not superseded in any way by review.

10. All shop drawings shall have clearly marked the appropriate specification number of drawing designation, for identification of the submittal.

E. Cabling

- 1. General:
 - a. Manufacturer's cable markings shall consist of manufacturer's name, cable type/catalog No., 1987 NFPA type code compliance, and the 2002 NEC code compliance.
 - b. All cable shall be listed for its use per NEC Article 800.
 - c. All cables shall meet performance specifications as required herein, with regards to ANSI/TIA/ELA 568-B.
 - d. All optical fibers in each cable shall be usable and each optical fiber shall be sufficiently free of surface imperfections and inclusions in order to meet the optical, mechanical and environmental requirements of this specification.
 - e. Singlemode optical fiber shall meet EIA/TIA- 492CAAA, "Detail Specification for Class IV a Dispersion-Unshifted Single-Mode Optical Fiber Cable."
 - 1) Maximum dispersion at 1310 nm wavelength shall be 2.8 PS/nm*km.
 - 2) Maximum dispersion at 1550 nm wavelength shall be 18 PS/nm*km.
 - f. 50/125 nm Multimode fiber optic cable shall meet EIA/TIA-492AAB, "Detail specification or 50 nm Core Diameter/125 nm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers" and the IEEE 10GbE Standard-2002".
 - 1) The maximum attenuation shall be 3.5 dB/km at 850nm and 1.5dB/km at 1300nm.
 - g. 62.5/125 nm Multimode fiber optic cable shall meet EIA/TIA-492AAAA-A-1997, "Detail Specification for 62.5 nm Core Diameter/125nm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers"
 - 1) The maximum attenuation shall be 3.5 dB/km at 350 nm and 1.5dB/km at 1300 nm.
 - h. The maximum tensile load on optical fiber cable during installation shall not exceed the following:
 - 1) 180 1bf for 2-strand cables.
 - 2) 250 1bf for 12-strand cables.
 - 3) 900 1bf for 36-strand cables.

- i. The maximum tensile loading of the installed fiber optic cable shall not exceed the following:
 - 1) 45 1bf for 2-strand cables.
 - 2) 84 1bf for 12-strand cables.
 - 3) 450 1bf for 36-strand cables.
- j. The minimum bend radius on the fiber optic cable during installation shall not exceed the following:
 - 1) 2.8- inches for 2-strand cables.
 - 2) 3.9- inches for 12-strand cables.
 - 3) 9.0- inches for 36-strand cables.
- k. The minimum bend radius on the installed fiber optic cable shall not exceed the following:
 - 1) 1.9- inches for 2-strand cables.
 - 2) 2.4-inches for 12-strand cables.
 - 3) 6-inches for 36-strand cables.
- 1. All 4-pair Unshielded Twisted Pair (UTP) copper distribution cabling shall be 24 AWG solid bare copper, 100-Ohm, Polyethylene insulated, with ripcord and shall be terminated using the ANSI/TIA/EIA- 568-B, T568B wiring scheme and pin-out configuration.
 - 1) Electrical performance- maximum attenuation at 250 MHz frequency shall not exceed 32.6 dB/100m.
 - 2) UTP cable shall be UL type CMR rated.
 - 3) Minimum bend radius shall be 1-inch.
 - 4) Maximum pulling tension shall be 25 lbs.

PART 3 - EXECUTION

3.1 DEMOLITION

- A. Refer to Architectural Section (General Conditions and Supplementary General Conditions) and Electrical Section of the Specifications for scheduling of Demolition and removal of existing work.
- B. Refer to specification section 02 41 19 Selective Demolition.
- C. The Electrical demolition work shall be performed by the Electrical Contractor in cooperation with the other trades and as scheduled and approved by the Owner.
- D. The Electrical Contractor shall visit the site before submitting his bid to familiarize himself with the existing conditions and the extent of his work. No extra compensation will be allowed for work required to be performed or to overcome existing conditions, by failure to visit the site.

- E. All power sources feeding circuits, feeders or equipment that are to be removed shall be disconnected at their source prior to the removal of any work. Raceways and wiring shall be removed in its entirety.
- F. All work shall be provided in strict accordance with the Massachusetts Electrical Code, National Codes and all Local Codes, and to the approval of the Engineer, Owner and Architect.
- G. Prior to removal from the site, all electrical equipment, conduit and wire shall be examined by the Owner to determine if any materials will be retained for maintenance or salvage purposes. If none of the material is to be retained all materials shall be removed from the site by this Contractor.

3.2 REFERENCE

A. Refer to Section 210000, 220000, 230000.

3.3 SPECIAL RESPONSIBILITIES

- A. Coordinate work of this Section with work of other Sections.
 - 1. Provide information about items furnished under this Section to be installed under other Sections, as necessary.
 - 2. Obtain detailed information from manufacturers of equipment provided under this Section as to proper methods of installation.
 - 3. Obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or by Owner.
 - 4. Keep fully informed of shape, size and position of openings required for material and equipment provided under this and other Sections. Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting and patching as necessary.
- B. Coordinate installation and pay backcharges to local electric and telephone companies and city building and fire departments.

3.4 UNDERGROUND CONDUITS

- A. Steel conduits in ground or on vapor barrier shall be field-coated with asphalt or shall have additional outside factory coating of polyvinyl chloride or phonemic-resin-epoxy material or other equally flexible and chemical-resistant material. Couplings and damaged areas of coated conduits shall be field-coated with same compound as conduits. Joints shall be threaded.
- B. Joints in conduits and fittings shall be watertight and shall meet requirements of manufacturer's installation recommendations. Threaded portions of steel conduits not encased in concrete, and adjoining ends of conduits, couplings and fittings, shall be coated with asphalt after installation. Connections between conduits of different types shall be made in approved manner, using adapters and other materials and methods recommended by conduit manufacturers.

- C. Where nonmetallic underground conduit enters building and continues inside to pull box, cabinet, or other electric apparatus, portion through floor or wall and within building shall be steel. Provide adapter below floor or outside wall to connect plastic and metal conduit.
- D. Where underground conduit enters building through membrane-waterproofed wall or floor, provide malleable iron seal with gland assembly and adjustable pressure bushings secured to masonry construction with one or more integral flanges. Membrane waterproofing shall be secured to device in watertight manner.
- E. Where underground conduit without concrete envelope enters building through nonwaterproofed wall or floor, provide Schedule 40 galvanized pipe sleeve. Fill space between conduit and sleeve with suitable plastic expandable compound or oakum and lead joint on each side of wall or floor.
- F. Excavation, shoring, bracing, backfiring and grading will be provided under Division
 2. Trenches shall be evenly graded so that conduits slope uniformly at least 3" per 100 feet, without horizontal or vertical waves. Unless specified otherwise, conduit shall slope uniformly from one manhole to next or from high point between manholes. Avoid low points between manholes, or upturned elbows. Where it is impossible to avoid trap or low point in conduit without concrete envelope, drill 1/2" hole in bottom of conduit at low point and provide crushed stone sump below conduit.
- G. Run conduits straight between manholes and upturned elbows. Unavoidable bends in nonmetallic conduits shall be made with assembling couplings at slight angle if resulting radius is at least 100 feet. For radii less than 100 feet, use 50 angle couplings or 5 factory-made bend sections. Conduits shall terminate in end bells where lines enter manholes.
- H. Support multiple conduit runs and banks on performed nonmetallic spacing blocks separators on 4' centers. Separator containing metal shall have metal noncontinuous and shall not form magnetic loop. Spacing between exterior surfaces of conduits shall be least 2" between telephone conduits, 2" between conduits containing cables operating at 600 V or less, 6" between telephone conduit and power conduit in same envelope, and 2-1/2" between conduits that contain cables operating at more than 600 V. Space separators to prevent sagging of conduits and breaking of couplings and watertight seals, to maintain deformation of conduit at separators to 0.10" or less. Secure with cords where necessary. Do not use tie wires, reinforcing rods or metallic materials.
- I. Stagger conduit couplings so that couplings on adjacent conduits do not lie in same transverse plane. Space end bells 9" center to center at manhole wall face for 4" conduits; space proportionately for other sizes. Transition to end bell spacing shall start 10 feet from face of manhole wall. Conduit slope shall equal that of main bank. Make new conduit entrances into existing manholes and building walls consistent with grading requirements and existing entrances; waterproof as required by Owner's Representative.
- J. Conduit envelopes shall be 2500 psi under Division 3, CONCRETE and shall extend at least three inches beyond exterior surface of each conduit in bank. Coordinate work of this section with that of Division 3.

- K. Envelopes may be poured directly against sides of trenches, if trench wall is clean, even and free of loose material. Remove loose dirt and extraneous material. Concrete shall be spaded during pouring to eliminate voids under and between conduits and honeycombing of exterior surfaces. Power-driven tampers or agitators shall not be used. Secure bolts sufficiently to prevent movement during concrete placement.
- L. Envelope between manholes shall be poured in single operation. Where more than one pour is necessary, provide 3/4" reinforcing rod dowels extending 18" into concrete on each side of joint.
- M. Envelope installed over extensive area of disturbed earth shall have separate 2500 psi concrete base.
- N. Envelope that crosses conduits, pipe lines under roads and driveways shall be reinforced. Provide reinforcement where envelopes connect to manhole and building walls. Envelopes that terminate for future extension shall have dowels as specified for joints between pours. Reinforcement shall be 3/4" rods in single layer 1-1/2" above bottom of envelope. Outside rods shall be 1-1/2" from outside edges of envelope and intermediate rod shall be placed in center of each space between conduits in lowest row.
- O. Trenches shall not be backfilled until envelopes have set sufficiently.
- P. After concrete envelopes have set, nonmetallic conduits shall be cleared with mandrel of same size as conduit.
- Q. Where conduits cross under existing roadways, walks and other paved areas, steel or wrought iron conduits may be driven instead of conduits in trenches. After installation, paved grass areas and other areas disturbed shall be restored to original condition. Cap ends of spare conduits five feet beyond pavement and protect from mechanical damage. Mark conduit ends with concrete monuments 6" in diameter by 18" long set flush in ground with "S/C" indented in top.
- R. Arrange multiple conduit as shown on drawings. Make minor changes in location or cross sectional arrangement shall be made as necessary. Where conduit runs cannot be installed as shown because of conditions not discoverable prior to digging of trenches, request Owner's Representative's instructions before further work is done. Coordinate with other outside service work. Maintain existing outside services, unless directed otherwise by Owner's Representative and Owner.
- S. Seal active and spare conduit and duct that enters building shall be completely and at first termination with oakum or plastic expandable compound.

3.5 TRANSFORMERS

A. Full-capacity standard NEMA taps shall be provided in the primary windings of transformers having a primary rating in excess of 600 volts. Three-phase transformers shall be connected only in a delta-wye or wye-delta configuration, as indicated [except isolation transformers having a one-to-one turns ratio]. "T" connections may be used for transformers rated at 15 kVA or below. The insulation on transformer windings may be the manufacturer's standard for transformers rated for operation in a 40-degree Celsius ambient temperature unless a higher-temperature insulation is shown, specified or required by the application indicated. [Single kVA ratings shown are based on self-cooled operation.] [Transformers rated above 300 kVA shall be equipped with features to permit the future addition of cooling fans, control circuit devices and wiring.] The [conventional dry-type transformer] shown located within 5 feet of the exterior wall shall be provided in a weatherproof enclosure. Transformers to be located within the [building] may be provided in the manufacturer's standard, ventilated indoor enclosure designed for use in a 40-degree Celsius ambient temperature, unless otherwise specified or shown.

3.6 MAIN ELECTRICAL SYSTEM INSTALLATION

- A. Equipment and devices shall be installed and energized in accordance with the manufacturer's published instructions.
- B. Conformance to Codes: The installation shall comply with the requirements and recommendations of NFPA 70 and ANSI C2.
- C. Verification of Dimensions: The Contractor shall become familiar with details of the work, shall verify dimensions in the field, and shall notify the Owner's Representative of any discrepancy before performing any work.
- D. Concrete Foundations
 - 1. Concrete Pads: Concrete pads for pad-mounted electrical equipment shall be constructed as indicated. Tops of concrete pads shall be level and shall project four inches above finished [floor] [paving or grade] and sloped to drain. Conduits for primary, secondary, and grounding conductors shall be set in place prior to placing of concrete pads. Concrete work shall comply with the requirements of Section [03300] CONCRETE FOR BUILDING CONSTRUCTION.
- E. Surface Treatment: Horizontal spaces between concrete foundations or pads and fences shall be excavated to minimum depth of six] inches) below finished gradelines, shall be graded to level surfaces, and filled with well-compacted clean coarse gravel or crushed stone of (1/2 to 1-1/2 inches) in size up to finished gradelines.
- F. Spare Accessory Storage: A cabinet shall be provided for storage of equipment accessories as necessary, including spare fuses, fuse tongs, switch sticks, and other tools and located where indicated. Shelves or other appropriate supporting methods shall provide an individual space for each type of item stored.
- G. Field Welding: Procedures and welders shall be qualified in accordance with AWS D1.1 for structural welding and ASME BPV IX for welding of equipment. Welding procedures qualified by others, and welders and welding operators qualified by a previously qualified employer may be accepted as permitted by ASME B31.3. The Owner's Representative shall be notified 24 hours in advance of tests and the tests shall be performed at the work site if practical. The Owner's Representative shall be provided with a copy of qualifying procedures and a list of names and identification symbols of qualified welders and welding operators. The welder or welding operator shall apply his assigned symbol near each weld he makes as a permanent record.

- H. Disposal of Liquid Dielectrics: PCB contaminated dielectrics must be marked as PCB and transported to and incinerated by an approved EPA waste disposal facility. The Contractor shall furnish certification of proper disposal. Contaminated dielectric shall not be diluted to lower the contamination level.
- I. Equipment Installation
 - 1. Transformer Stations: Transformer stations shall be installed in accordance with IEEE C57.12.11 and shall be fence-enclosed type and mounted on concrete pads. Three-phase transformer installations shall be installed with 3 phase sequence. Primary taps shall be set in accordance with the coordination study.
 - 2. Equipment Finishes: Equipment shall be carefully installed so as not to scratch finishes. After installation, finished surfaces shall be inspected and scratches touched up with a finish provided by the manufacturer especially for this purpose.
 - 3. Supports: Enclosures and enclosure supports shall be installed in accordance with manufacturer's instructions. Supports shall consist of anchored channels leveled and then embedded in the concrete foundation. Channels, anchors, shims, or other leveling items shall be installed in accordance with the recommendations of the equipment manufacturer.
 - 4. Switchgear Leveling: After leveling items are correctly installed, switchgear lineups shall be out-of-plumb by not more than (1/4 inch) for the entire length and width. Insertion or withdrawal of removable elements shall be easily accomplished, and component devices shall operate properly after the switchgear assembly is completely installed.
 - 5. Incoming Line Surge Arresters: Surge arresters of the [station] type shall be provided on each phase of each incoming line circuit, and mounted on station structures as shown.
 - 6. Transformer Surge Arresters: Surge arresters of the [station] type, suitable for [a grounded] system and for the associated transformer primary line-to-ground voltage, shall be mounted next to each high-voltage bushing on a transformer tank-mounted bracket and connected to a surge arrester ground pad. Discharge counters shall be provided and mounted on the brackets.
- J. Electrical Bus Connections
 - 1. All connections to aluminum bus shall be cleaned and coated with an inhibiter in accordance with manufacturer's recommended methods. All bolted connections shall be torqued to the correct tightness. The Contractor shall establish a checklist to insure that bolted connections have been properly coated and correctly torqued. All welded connections on aluminum buswork shall be by the gas metal-arc welding process. The shield inert gas shall be argon. The welder shall be certified for gas metal-arc welding.
- K. Grounding: A grounding grid, consisting of the indicated configuration of bare copper conductors and driven ground rods shall be installed as shown on the drawings. Grounding grid shall comply with IEEE Std 80. Equipment frames of metal-enclosed

equipment, medium-voltage cable terminations, chain-link fencing, metal-structures, and other noncurrent-carrying metal items shall be connected to the ground grid as shown. At least two connections shall be provided from [a power transformer,] [a switchgear ground bus,] [an oil circuit breaker enclosure,] [and] [a grounded iron platform plate] to the ground grid. Fences shall be grounded at each fixed gate post, each corner post, and at intermediate posts as indicated. Each gate section shall be bonded to its gate posts with a 1/8 inch by 1 inch flexible braided copper strap and ground post clamps. Fence ground clamps shall be of a type that inhibits corrosion between metal parts. Outriggers shall be grounded as shown.

- 1. Grounding electrodes shall be as follows:
 - a. Driven rod electrodes Unless otherwise indicated, ground rods shall be driven into the earth until the tops of the rods are approximately one foot below finished grade.
 - b. Grid grounding electrodes A grid grounding electrode shall be installed as shown consisting of bare copper conductors installed, ([12] [18] [24] inches,) plus or minus 3 inches, below the finished top of soil grade. Grid conductors shall be bonded to all rod electrodes, and to all other intersecting grid conductors. Grid conductors shall be sized as shown.
- 2. Grounding and Bonding Connections: Connections above grade shall be made by the fusion-welding process or with bolted solderless connectors, in compliance with UL 467, and those below grade shall be made by the fusion-welding process. Where grounding conductors are connected to aluminum-composition conductors, specially treated or lined copper-to-aluminum connectors suitable for this purpose shall be used.
- 3. Grounding and Bonding Conductors: Grounding and bonding conductors include all conductors used to bond transformer enclosures, equipment frames and structural members to the grounding grid. Grounding and bonding conductors shall be sized as shown. After being located to provide maximum physical protection, exposed grounding conductors shall be securely attached to structural supports at not more than two foot intervals with suitable fasteners. Bends greater than 45 degrees in ground conductors are not permitted. Routing of ground conductors through concrete should be avoided. When concrete penetration is necessary, nonmetallic conduit shall be cast flush with the points of concrete entrance and exit so as to provide an opening for the ground conductor, and the opening shall be sealed with a suitable compound after installation.
- 4. Surge Arrester Grounding: Surge arresters and neutrals shall be bonded directly to the transformer enclosure and then to the grounding grid with a bare copper conductor, minimum size [4/0] [as shown]. Lead lengths shall be kept as short as practicable with no kinks or sharp bends.
- L. Field Testing
 - 1. General: Field testing shall be performed in the presence of the Owner's Representative. The Contractor shall notify the Owner's Representative 7 days prior to conducting tests. The Contractor shall furnish all materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform all tests

and inspections recommended by the manufacturer unless specifically waived by the Owner's Representative. The Contractor shall maintain a written record of all tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. All field test reports will be signed and dated by the Contractor.

- 2. Safety: The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor shall replace any devices or equipment which are damaged due to improper test procedures or handling.
- 3. Ground-Resistance Tests: The resistance of [each grounding electrode system] shall be measured using the fall-of-potential method defined in IEEE Std 81. Soil resistivity in the area of the grid shall be measured concurrently with the grid measurements. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.
 - a. Single rod electrode [25 ohms].
 - b. Grid electrode [____] ohms.
- 4. Ground-Grid Connection Inspection: All below-grade ground-grid connections will be visually inspected by the Owner's Representative before backfilling. The Contractor shall notify the Owner's Representative 48 hours before the site is ready for inspection.
- 5. Liquid-Filled Transformer Tests: The following field tests shall be performed on all liquid-filled transformers 500 kVA and above].
 - a. Insulation resistance test phase-to-ground.
 - b. Turns ratio test.
 - c. Correct phase sequence.
 - d. Correct operation of tap changer.
- 6. Dry-Type Transformer Tests: The following field tests shall be performed on all dry-type transformers 30 kVA and above].
 - a. Insulation resistance test phase-to-ground.
 - b. Turns ratio test.
- 7. Circuit Breaker Tests: The following field tests shall be performed on circuit breakers.
 - a. Insulation resistance test phase-to-phase.
 - b. Insulation resistance test phase-to-ground.
 - c. Closed breaker contact resistance test.
 - d. Power factor test.

- e. High-potential test.
- f. Liquid dielectric test for oil breakers in accordance with ASTM D 923.
- g. SF6 dielectric test for SF6 breakers in accordance with ASTM D 2472.
- h. Manual and electrical operation of the breaker.
- 8. Protective Relays: Protective relays shall be visually and mechanically inspected, adjusted, tested, and calibrated in accordance with the manufacturer's published instructions. Tests shall include pick-up, timing, contact action, restraint, and other aspects necessary to insure proper calibration and operation. Relay settings shall be implemented in accordance with the coordination study. Relay contacts shall be manually or electrically operated to verify that the proper breakers and alarms initiate. Relaying current transformers shall be field tested in accordance with IEEE C57.13.
- 9. Operating Tests: After the installation is completed, and at such time as the Owner's Representative may direct, the Contractor shall conduct operating tests for approval. The equipment shall be demonstrated to operate in accordance with the requirements herein. An operating test report shall be submitted in accordance with paragraph TEST REPORTS.
- M. Manufacturer's Field Service
 - 1. Onsite Training: The Contractor shall conduct a training course for the operating staff as designated by the Owner's Representative. The training period shall consist of a total of 48 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests. The course instruction shall cover pertinent points involved in operating, starting, stopping, servicing the equipment, as well as all major elements of the operation and maintenance manuals. Additionally, the course instructions shall demonstrate all routine maintenance operations.
 - 2. Installation Engineer: After delivery of the equipment, the Contractor shall furnish one or more field engineers, regularly employed by the equipment manufacturer to supervise the installation of the equipment, assist in the performance of the onsite tests, initial operation, and instruct personnel as to the operational and maintenance features of the equipment.
- N. Acceptance: Final acceptance of the facility will not be given until the Contractor has successfully completed all tests and after all defects in installation material or operation have been corrected.

3.7 FIRESTOPPING INSTALLATION

- A. Install firestopping assembly at locations shown and as specified in accordance with UL FRD systems or FM P7825 designs, and as recommended by manufacturer. Do not cover or enclose firestopped areas until approved by the Owner's Representative.
 - 1. Firestopping Locations: Completely fill openings around penetrating items with firestopping material to prevent spread of fire in the following locations:

- a. Around duct, cable, conduit, piping, and their supports that penetrate firerated above grade floor slabs, interior partitions, and exterior walls.
- b. Around openings and penetrations through fire-rated ceiling assemblies.
- c. Around penetration of vertical fire-rated service shafts.
- d. Around openings and penetrations through fire-rated enclosures.
- e. Other locations indicated.
- 2. Filling of Voids: Completely fill voids flush with the surface; the depth of material shall be in accordance with UL FRD or FM P7825. Firestopping for filling voids in floors in which smallest dimension of a void is 4 inches or more shall support the floor design load or be protected by a permanent barrier. Damaged, disrupted, or removed firestoppings shall be replaced with new firestoppings as specified in this section.
- 3. Insulated Pipes and Ducts: Cut and remove thermal insulation where pipes or ducts pass through firestoppings. Replace thermal insulation with a material having equal thermal insulating characteristics and equal firestopping characteristics.

3.8 GROUNDING

- A. Provide equipment grounding system as shown on Drawings. Equipment grounding system shall be designed so metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items in close proximity with electrical circuits operate continuously at ground potential and provide low impedance path for possible ground fault currents.
- B. System shall meet NEC requirements, modified as shown on Drawings and as specified.
- C. Provide grounding network as shown on Drawings consisting of:
 - 1. Ground loop minimum size #4/0 copper wire buried around building.
 - 2. Appropriate number of ³/₄" diameter, 10' long copper-clad steel ground rod clusters and #4/0 copper ground wire connections from grounding loop to column as indicated.
 - 3. #4/0 grounding conductor at each panel cluster and to main switchgear and service transformers.
 - 4. Ground points shall be driven to achieve 5 ohms. Provide additional rods as required to achieve 5 ohms overall. Where geological conditions dictate, ground wire mesh may be provided or additional rods shall be driven in compacted earth areas as required to meet 5 ohm resistance requirement.
 - 5. Connections to ground loop system shall be made with Cadweld Process.
- D. Provide separate green insulated equipment grounding conductor for each single or three-phase feeder and each branch circuit. Install grounding conductor in common

conduit with related phase or neutral conductors, or both. Parallel feeders installed in more than one raceway shall have individual full size green insulated equipment ground conductors.

- E. Determine numbers and sizes of screw terminals for equipment grounding bars in panelboards and other electrical equipment. Provide screw terminals for active circuits, spares and spaces.
- F. Provide green insulated grounding conductor in same raceway with associated phase conductors, as follows:
 - 1. From green ground terminals of receptacles to green 10-32 washer-in-head outlet box machine screw. (Receptacles with special cast boxes and factory-designed and approved ground path do not require separate ground jumper.)
 - 2. From green 10-32 washer-in-head machine screw in ceiling outlet box or junction box through flexible metallic conduit to ground terminal in fixture.
 - 3. From green 10-32 washer-in-head machine screw in ceiling outlet box or junction box through flexible metallic conduit to green 10-32 washer-in-head machine screw in switch outlet box in movable partitions.
 - 4. From green 10-32 washer-in-head machine screw in junction box or disconnect switch through flexible metallic conduit to ground terminal in connection box mounted on single phase fractional horsepower motor.
 - 5. From equipment ground bus in motor control center through conduit and flexible metallic conduit to ground terminal in connection box mounted on three-phase motor. Ground conductor motors with separate starters and disconnect devices shall originate at ground bar in panelboard and shall be bonded to each starter and disconnect device enclosure.
 - 6. From (switchboard) (switchgear) (distribution panel) equipment ground bus to panelboard equipment ground bus.
 - 7. From (distribution panel) equipment ground bar to equipment grounding bar on busway.
 - 8. From computer area power panel ground bar for branch circuits as required by NEC. No ground conductor circuit shall exceed 3 ohms resistance to building ground system.
- G. Provide green insulated grounding conductor in nonmetallic conduits or ducts unless specified otherwise.

3.9 NAMEPLATES

A. Provide nameplates in or on switchboards, panelboards, junction boxes and cabinets, and for special purpose switches, motor disconnect switches, remote control stations, starters or other controls furnished or installed under this Section. Nameplates shall designate equipment controlled and function.

B. Nameplates shall be laminated black bakelite with 1/4" high white recessed letters. Nameplates shall be securely attached to the equipment with galvanized screws. Adhesives or cements shall not be used.

3.10 WIRING METHODS

- A. Install wire and cable in approved raceways as specified and as approved by authorities that have jurisdiction. Surface metal raceways shall not be used unless explicitly specified and shown on Drawings. Do not use surface raceways on floor. Do not use armored cable except as approved by local code for lighting and receptacle circuits in suspended ceilings and stud-wall partitions. Homeruns for lighting circuits shall be 3-phase, 4-wire run in conduit.
- B. Wire from point of service connection to receptacles, lighting fixtures, devices, equipment, outlets for future extension, and other electrical aparata as shown on Drawings. Provide slack wire for connections. Tape ends of wires and provide blank covers for outlet boxes designated for future use.
- C. Conductors #10 and smaller in branch circuit panelboards, signal cabinets, signal control boards, switchboards and motor control centers shall be bundled. Conductors larger than #10 in switchboards, motor control centers and pull boxes shall be cabled in individual circuits.
- D. Two or more conduits installed instead of single conduit shall contain duplicate conductors, including neutrals and ground conductors where required; total capacity of duplicate conductors shall be at least equal to capacity of conductors replaced.
- E. Follow homerun circuit numbers shown on Drawings to connect circuits to panelboards. Where homerun circuit numbers are not shown on Drawings, divide similar types of connected loads among phase buses so that currents are approximately equal in normal usage. Connect each branch circuit homerun with two or more circuits and common neutral to circuit breaker or switch in three-wire or four-wire branch circuit panelboard so that no two circuits are fed from same bus. Where panelboard cabinets are recessed, provide conduits with sufficient capacity for future conductors for spare branch circuit protective devices and spaces in panelboard; stub up concealed to junction box. Provide extensions above ceiling.
- F. Electrical metallic tubing may be used generally, if approved by local codes, for lighting fixture and receptacle circuits, telephone, inter-communications, signal and instrumentation circuits, and for control circuits. EMT may be used generally, if approved by authorities, in masonry walls, above hung ceilings, in equipment rooms, in mechanical and electrical chases and closets, in exposed locations along ceilings or walls above normal traffic level and where not subject to accidental damage or abuse. Do not run EMT exposed below 8 feet above finished floor.
- G. Install connectors and couplings as recommended by manufacturers. Compression fittings shall not be used with rigid steel, intermediate metallic or aluminum conduit. Set screw fittings shall not be used with rigid aluminum conduit and shall not be used for other applications, unless specified and approved by Owner's Representative. If set-screw connectors are used, tighten to imbed screws in conduit.

- H. Conduit in concrete shall be rigid steel. EMT shall not be installed underground, in slabs on grade, in wet locations, in hazardous areas, or for circuits operating at more than 600 V. Buried metallic conduit shall be rigid steel. Run conduit in slabs above bottom steel reinforcing, below top reinforcing and inside beam stirrup, wall reinforcements and column ties.
- I. Rigid non-metallic conduit as specified in Part 2 of this Section may be used, if approved by local authorities, for installation in concrete slabs when installed as required by NEC and manufacturer's requirements. Penetrations from concrete slabs shall be made with rigid steel conduit and rigid steel conduit fittings only.
- J. Maximum outside diameters of raceways in conduit shall be 1/3 slab thickness. No more than two 3/4" raceways shall cross in floor slab at a single point. Submit raceway crossing locations for approval before pouring slabs and relocate at no expense to Owner as directed by Owner's Representative. Lateral spacing of parallel raceways shall be at least 6" on centers. Do not run conduit in slab less than 3" thick without express approval and direction of Owner's Representative.
- K. Raceways with outside diameters larger than 1/3 slab thickness shall be run concealed in hung ceilings in finished areas, exposed in unfinished Mechanical/Electrical and storage areas, below slabs on grade.
- L. Penetrate waterproof walls of structural slabs and foundation walls only where approved by Owner's Representative. Submit proposed penetration points, size openings and penetration methods to Owner's Representative for approval.
- M. Provide flexible conduits for connections to electrical equipment and to equipment furnished under Divisions 14 and 15 that are subject to movement, vibration or misalignment; where available space dictates; and where noise transmission must be eliminated or reduced. Flexible conduit shall be liquid-tight under following conditions:
 - 1. Exterior locations
 - 2. Moisture or humidity-laden atmospheres
 - 3. Corrosive atmospheres
 - 4. Where wash-down operations are possible
 - 5. Where seepage or dripping of oil, grease or water is possible
- N. Run concealed conduit and EMT in as direct lines as possible with minimum number of bends of longest possible radius. Run exposed conduit and EMT parallel to or at right angles to building lines. Ends shall be free from dents or flattening.
- O. Conduit and EMT runs shall be mechanically and electrically continuous from service entrance to outlets. Conduit shall enter and be secured to cabinet, junction box, pull box or outlet box with locknut outside and bushing inside, or with liquid-tight, threaded, self-locking, cold-weld wedge adapter. Provide additional locknut for rigid conduit and wrench- tighten locknut for EMT or flexible conduit where circuit voltage exceeds 250 V. Locknuts and bushings or self-locking adapters will not be required
where conduits are screwed into tapped connections. Vertical conduit runs that terminate in bottoms of wall boxes or cabinets shall be protected from entrance of foreign material before installation of conductors.

- P. Size rigid steel conduit, EMT and flexible metallic conduit as required by NEC except as specified or shown on Drawings otherwise. Unless shown otherwise on Drawings, telephone conduits shall be at least 1".
- Q. Check raceway sizes to determine that green equipment ground conductor fits in same raceway with phase and neutral conductors to meet NEC percentage of fill requirements. Increase duct, conduit, tubing and raceway sizes shown or specified as required to accommodate conductors.
- R. Unless specified or shown on Drawings otherwise, install conduit and EMT concealed. Unless specified or shown otherwise, conduit and EMT may be run exposed on unfinished walls and unfurred basement ceilings and in unfinished penthouses, attics and roof spaces. Provide stand-off clips for conduits on exterior masonry walls.
- S. Install conduit systems complete before drawing in conductors. Blow through and swab after plaster is finished and dry, and before conductors are installed.
- T. Expansion/Deflection Fittings: Conduit buried or secured rigidly on opposite sides of building expansion joints and long runs of exposed conduit subject to stress shall have expansion fittings. Fittings shall safely deflect and expand to twice distance of structural movement.
 - 1. Provide separate external copper bonding jumper secured with grounding straps on each end of fitting.
 - 2. Conduits buried in concrete shall cross building expansion joints at right angles; provide expansion fittings as required by manufacturer's instructions. Provide insulated bushings at ends of conduits.
- U. Sealing Fittings: Threaded sealing fittings for rigid steel conduits shall be zinc- or cadmium-coated, cast or malleable iron; sealing fittings for aluminum conduit shall be threaded cast aluminum. Fittings that prevent passage of water vapor shall be continuous drain.
 - 1. Install and seal fittings as required by manufacturer's recommendations. In concealed work, install fittings in flush steel box with blank cover plate.
 - 2. Install sealing fittings at following points, and elsewhere as shown:
 - a. Where conduits enter or leave hazardous areas equipped with explosionproof lighting fixtures, switches, receptacles and other electrical devices.
 - b. Where conduits pass from warm to cold locations.
 - c. Where required by NEC.
 - 3. Secure conduit system as required by NEC.
- V. Attach pull ropes to conductors with basket-weave grips on pulling eyes. Pull cables that share conduit at same time.

W. Provide inserts, hangers, anchors and steel supports as necessary.

3.11 WIRING DEVICE PLATES

A. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed with an alignment tolerance of 1/16 inch. The use of sectional-type device plates will not be permitted. Plates installed in wet locations shall be gasketed and provided with a hinged, gasketed cover, unless otherwise specified.

3.12 RECEPTACLES

- A. Single and Duplex: Receptacle shall be side- or back-wired with two screws per terminal. The third grounding pole shall be connected to the metal mounting yoke.
 Only the top receptacle of a duplex receptacle shall be wired for switching application.
- B. Weatherproof Applications
 - 1. Damp Locations: Receptacles in damp locations shall be mounted in an outlet box with a gasketed, weatherproof, cast-metal cover plate (device plate, box cover) and a gasketed cap (hood, receptacle cover) over each receptacle opening. The cap shall be either a screw-on type permanently attached to the cover plate by a short length of bead chain or shall be a flap type attached to the cover with a spring loaded hinge.
 - 2. Wet Locations: Receptacles in wet locations must be installed in an assembly rated for such use whether the plug is inserted or withdrawn, unless otherwise indicated. In a duplex installation, the receptacle whether one or both receptacles are in use. [Assemblies which utilize a self-sealing boot or gasket to maintain wet location rating shall be furnished with a compatible plug at each receptacle location and a sign notifying the user that only plugs intended for use with the sealing boot shall be connected during wet conditions].

3.13 WALL SWITCHES

A. Not more than [one switch] shall be installed in a single-gang position. Dimming switches shall be flush mounted.

3.14 SERVICE EQUIPMENT

A. Service-disconnecting means shall be of the [enclosed molded-case circuit breaker] or [fusible safety switch] (as shown on drawings) type as indicated with external handle for manual operation. When service disconnecting means is a part of an assembly, the assembly shall be listed as suitable for service entrance equipment. Enclosures shall be sheet metal with hinged cover for surface mounting unless otherwise indicated.

3.15 PANELBOARDS

A. Circuit breakers and switches used as a motor disconnecting means, and not in sight of the motor and the driven machinery location, shall be capable of being locked in the open position. Door locks shall be keyed alike. Nameplates shall be as approved.

Directories shall be typed to indicate loads served by each circuit and mounted in a holder behind a clear protective covering. Busses shall be copper or aluminum.

- 1. Loadcenters: Loadcenters shall be circuit breaker equipped.
- 2. Panelboards: Panelboards shall be circuit breaker or fusible switch equipped as indicated on the drawings. [Fusible panelboards of the multipole type may have doors over individual circuits and trim over the wiring gutter only, provided each circuit is arranged for locking in the open and closed positions and each branch circuit has an individual identification card in a cardholder with a clear plastic covering.] [Multipole fusible switches shall be of the hinged-door type; single pole fusible switches shall be of the tumbler switch and fuse type. Switches serving as a motor disconnect means shall be of the tumbler switch and fuse type. Switches serving as motor disconnect means shall be horsepower rated in conformance with UL 98.]

3.16 FUSES

A. Equipment provided under this contract shall be provided with a complete set of properly rated fuses when the equipment manufacturer utilize fuses in the manufacture of the equipment, or if current-limiting fuses are required to be installed to limit the ampere-interrupting capacity of circuit breakers or equipment to less than the maximum available fault current at the location of the equipment to be installed. Fuses shall have a voltage rating of not less than the phase-to-phase circuit voltage, and shall have the time-current characteristics required for effective power system coordination.

3.17 UNDERGROUND SERVICE

A. Unless otherwise indicated, interior conduit systems shall be stubbed out 5 feet beyond the building wall and 2 feet below finished grade, for interface with the exterior service lateral conduits [and exterior communications conduits]. Outside conduit ends shall be bushed and capped, or plugged until connected to exterior conduit systems. Underground service lateral conductors will be extended to building service entrance and terminated in accordance with NFPA 70.

3.18 MOTORS

A. Motors shall be as specified in paragraph Motors, ac, Fractional and Integral Kilowatt, (Horsepower,) whether or not motors are separately provided or included in equipment assemblies specified in other sections of these specifications. Each motor shall conform to the kW (hp) (hp) and voltage ratings indicated, and shall have a service factor and other characteristics that are essential to the proper application and performance of the motors under conditions shown or specified. Three-phase motors for use on 3-phase 208-volt systems shall have a nameplate rating of 200 volts. Unless otherwise specified, all motors shall have open frames, and continuous-duty classification based on a 40 degree C ambient temperature reference. Polyphase motors shall be squirrel-cage type, having normal-starting-torque and low-starting-current characteristics, unless other characteristics are specified in other sections of these specifications or shown on contract drawings. The Contractor shall be responsible for selecting the actual kilowatt (horsepower) (horsepower) ratings and other motor requirements necessary for the applications indicated. When electrically

driven equipment furnished under other sections of these specifications materially differs from the design, the Contractor shall make the necessary adjustments to the wiring, disconnect devices and branch-circuit protection to accommodate the equipment actually installed.

3.19 MOTOR-DISCONNECT MEANS

A. Each motor shall be provided with a disconnecting means when required by NFPA 70 even though not indicated. For single-phase motors, a single or double pole toggle switch, rated only for alternating current, will be acceptable for capacities less than 30 amperes, provided the ampere rating of the switch is at least 125 percent of the motor rating. Switches shall disconnect all ungrounded conductors.

3.20 LAMPS AND LIGHTING FIXTURES

- A. Ballasted fixtures shall have ballasts which are compatible with the specific type and rating of lamps indicated and shall comply with the applicable provisions of the publications referenced.
 - 1. Lamps: Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed in the fixtures just prior to the completion of the project.
 - 2. Fixtures: Fixtures shall be as shown and shall conform to the specifications and shall be as detailed on Drawing. In suspended acoustical ceilings with fluorescent fixtures, the fluorescent emergency light fixtures shall be furnished with self-contained battery packs.
 - a. Accessories: Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation. Open type fluorescent fixtures with exposed lamps shall have a wire-basket type guard.
 - b. Suspended Fixtures: Suspended fixtures shall be provided with swivel hangers in order to ensure a plumb installation. Pendants, rods, or chains 4 feet or longer excluding fixture, shall be braced to limit swinging. Bracing shall be 3 directional, 120 degrees apart. Single unit suspended fluorescent fixtures shall have twin-stem hangers. Multiple unit or continuous-row fluorescent units shall have a tubing or stem for wiring at one point, and a tubing or rod suspension provided for each length of chassis including one at each end. Maximum distance between adjacent tubing or stems shall be 10 feet. Rods shall be of not less than 3/16 inch diameter. Flexible raceway shall be installed to each fixture from an overhead junction box. Fixture to fixture wiring installation is allowed only when fixtures are installed end to end in a continuous run.
 - c. Ceiling Fixtures: Ceiling fixtures shall be coordinated with and suitable for installation in, on, or from the suspended ceiling provided under other sections of these specifications. Installation and support of fixtures shall be in accordance with the NFPA 70 and manufacturer's recommendations. Where seismic requirements are specified herein, fixtures shall be supported as shown or specified. Recessed fixtures shall have adjustable fittings to permit alignment with ceiling panels. Recessed fixtures installed in fire-

resistive type of suspended ceiling construction shall have the same fire rating as the ceiling or shall be provided with fireproofing boxes having materials of the same fire rating as the ceiling panels, in conformance with UL-03.

- d. Do not install fixtures until work of other trades that may damage fixtures is completed.
- e. Provide plaster frames for fixtures recessed in gypsum board or plaster ceiling.
- f. Do not suspend or support lighting fixtures or safety chains from hung ceiling conduit or duct. Support fixtures with threaded rod from structural members only.
- g. Provide unistrut below ducts where fixture locations coincide with duct runs. Provide threaded rods to support unistrut.
- h. Luminaires shall be compatible with flexible wiring system.
- i. Patch spray-on fireproofing damaged during installation.
- j. Support surface-mounted luminaires at least two concealed points to prevent rotation.
- k. Fire-rated enclosures necessary for fixture housings above ceiling will be provided under another Section.
- 1. Mounting height of suspended or wall-mounted luminaires shall be shown on Drawings.
- m. Locate ceiling-mounted fixtures as shown on reflected ceiling plans. Locate wall- and floor-mounted fixtures as shown on Electrical Drawings.
- n. Coordinate aiming of adjustable fixtures with Owner's Representative.

3.21 EXTERIOR LIGHTING

- A. General: The Contractor shall install all system components, including Owner furnished equipment, and appurtenances in accordance with the manufacturer's instructions, ANSI C2, and contract documents, and shall furnish necessary hardware, fixtures, cables, wire, connectors, interconnections, services, and adjustments required for a complete and operable system.
- B. Current Site Conditions: The Contractor shall verify that site conditions are in agreement with the design package. The Contractor shall report all changes to the site or conditions that will affect performance of the system to the Owner. The Contractor shall not take any corrective action without written permission from the Owner.
- C. Existing Equipment: The Contractor shall connect to and utilize existing lighting equipment and devices as shown. Lighting equipment that is usable in their original configuration without modification may be reused with Owner approval. The Contractor shall perform a field survey, including testing and inspection of existing lighting equipment and control lines intended to be incorporated into the lighting system, [and furnish a report to the Owner]. For those items considered nonfunctioning, specification sheets, or written functional requirements to support the findings and the estimated cost to correct the deficiency shall be provided with the

report. As part of the report, the Contractor shall include the scheduled need date for connection to all existing equipment. The Contractor shall make written requests and obtain approval prior to disconnecting any control lines and equipment, and creating equipment downtime. Such work shall proceed only after receiving Owner approval of these requests. If any device fails after the Contractor has commenced work on that device, the Contractor shall diagnose the failure and perform any necessary corrections to the equipment. The Owner is responsible for maintenance and repair of Owner equipment. The Contractor shall be held responsible for repair costs due to Contractor negligence or abuse of Owner equipment.

- D. Enclosure Penetrations: Enclosure penetrations shall be from the bottom unless the system design requires penetrations from other directions. Penetrations of interior enclosures involving transitions of conduit from interior to exterior, and penetrations on exterior enclosures shall be sealed with rubber silicone sealant to preclude the entry of water. The conduit riser shall terminate in a hot-dipped galvanized metal cable terminator. The terminator shall be filled with an approved sealant as recommended by the cable manufacturer, and in such a manner that the cable is not damaged.
- E. Prevention of Corrosion
 - 1. Aluminum: Aluminum shall not be used in contact with earth or concrete, and where connected to dissimilar metal, shall be protected by approved fittings and treatment.
 - 2. Steel Conduits: Steel conduits shall not be installed within concrete slabs-ongrade. Steel conduits installed underground or under slabs-on-grade, or penetrating slabs-on-grade, shall be field wrapped with 0.010 inch thick pipewrapping plastic tape applied with a 50 percent overlap, or shall have a factoryapplied plastic resin, epoxy coating. Zinc coating may be omitted from steel conduit which has a factory-applied epoxy coating.
 - 3. Cold Galvanizing: Field welds and/or brazing on factory galvanized boxes, enclosures, conduits, etc. shall be coated with a cold galvanized paint containing at least 95 percent zinc by weight.
- F. Lighting
 - 1. Lamps: Lamps of the proper type, wattage, and voltage rating shall be delivered to the project in the original containers and installed in the fixtures just before completion of the project.
 - 2. Fixture Installation: Standard fixtures shall be installed as detailed on Drawing(s), which accompany and form a part of this specification. Special fixtures shall be as indicated on drawings. Illustrations shown on these sheets or on the drawings are indicative of the general type desired and are not intended to restrict selection of fixtures to any particular manufacturer.
 - a. Accessories: Accessories such as straps, mounting plates, nipples, or brackets shall be installed as required for proper installation.
 - b. In-Line Fuses: An in-line fuse shall be provided for each fixture.

c. Special Fixtures: The types of special fixtures shall be designated by letters and numbers. For example, SP-1 denotes special type 1.

G. LIGHTING CONTROL SYSTEM

- 1. Time Control Switches: Switches shall be installed with not less than four 1/4 inch bolts. The use of sheet metal screws will not be allowed.
- 2. Manual and Safety Switches: Terminal lugs shall be coordinated with the wire size. Switches shall be securely fastened to the supporting structure or wall using not less than four 1/4 inch bolts. The use of sheet metal screws will not be allowed.
- H. Grounding: Grounding shall be in conformance with NFPA 70, the contract drawings, and the following. Grounding conductors shall be soft-drawn, stranded copper. Ground rods shall be driven into the earth so that after the installation is complete, the top of the ground rod will be approximately 1 foot below finished grade, except in handholes. [Butt grounds made of at least 13 feet of No. 6 bare copper wire stapled to the butts of wood poles in spirals may be used where a ground resistance of 25 ohms or less can be obtained by this method.] [Butt grounds shall not be used.]
 - Ground Rods and Pole Butt Electrodes: NOTE: Designer will determine the size, 1. type, and number of ground rods to be used, based on local conditions, earth resistivity data, and on the size and type of the electrical installation. Copper clad steel rods will be specified for normal conditions. Zinc coated steel or stainless steel rods will be used where low soil resistivities are encountered and galvanic corrosion may occur between adjacent underground metallic masses and the copper clad rods. Stainless steel rods have a longer life than the zinc coated steel, but use of stainless steel must be justified based on the higher cost. Rods 15.9 mm (5/8 inch) in diameter and 2.4 m (8 feet) in length are generally acceptable, however in rocky soils 19.1 mm (3/4 inch) rods will be specified. In high resistivity soils, 3.1 m (10 feet) or sectional rods may be used to obtain the required resistance to ground; however where rock is encountered, additional rods, a counterpoise, or ground grid may be necessary. The resistance to ground shall be measured using the fall-of-potential method described in IEEE Std 81. The maximum resistance of a [driven ground rod] [pole butt electrode] shall not exceed 25 ohms under normally dry conditions. Whenever the required ground resistance is not met, additional electrodes shall be provided [interconnected with grounding conductors] [as indicated], to achieve the specified ground resistance. The additional electrodes shall be [up to three, [8 feet (10 feet) rods spaced a minimum of [(10 feet) (120 feet) apart] [a single extension-type rod, [(5/8 inch)] [(3/4 inch)] diameter, up to 30 feet long, [driven perpendicular to grade] [coupled and driven with the first rod]]. In high ground resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Owner's Representative shall be notified immediately. Connections below grade shall be fusion welded. Connections above grade shall be fusion welded or shall use UL 467 approved connectors.
 - 2. Items to be Grounded: Ground conductors, metallic conduits, junction boxes, and noncurrent-carrying metallic parts of equipment shall be grounded. Connections

above grade shall be made with solderless connectors, and those below grade shall be made by a fusion-welding process.

- 3. Lighting Pole: One ground rod shall be provided at each pole. Bases of metal or concrete lighting poles shall be connected to ground rods by means of No. 8 AWG bare copper wire. Lighting fixture brackets on wood and concrete poles shall be grounded to a No. 6 AWG bare copper grounding conductor connected to the ground rod.
- 4. Handhole: In each handhole, at a convenient point close to the wall, a ground rod shall be driven into the earth before the floor is poured, and approximately 100 mm (4 Inches) of the ground rod shall extend above the floor after pouring. When precast concrete units are used, the top of the ground rod may be below the floor, and a No. 1/0 AWG copper ground conductor shall be brought inside through a watertight sleeve in the wall. Connection to ground rods shall be by means of bolted-clamp terminals or by an approved fusion-welding process. Ground wires shall be neatly and firmly attached to handhole walls, and the amount of exposed bare wire shall be held to a minimum.
- 5. Metal Cable Boxes: Metal cable boxes for direct-burial cable shall be connected to adjacent ground rods by wires with current-carrying capacities of at least 20 percent of the spliced phase conductors, but not less than No. 6 AWG.

3.22 STANDBY GENERATING SYSTEMS

A. Installation shall provide clear space for operation and maintenance in accordance with NFPA 70 and ANSI C2. Installation of pipe, duct, conduit, and ancillary equipment shall be configured to facilitate easy removal and replacement of major components and parts of the engine-generator set.

3.23 LIGHTNING PROTECTION INSTALLATION

- A. Integral System
 - 1. General Requirements: The lightning protection system shall consist of air terminals, roof conductors, down conductors, ground connections, and grounds, electrically interconnected to form the shortest distance to ground. All conductors on the structures shall be exposed except where conductors are in protective sleeves exposed on the outside walls. Secondary conductors shall interconnect with grounded metallic parts within the building. Interconnections made within side-flash distances shall be at or above the level of the grounded metallic parts.
 - a. Air Terminals: Air terminal design and support shall be in accordance with NFPA 780. Terminals shall be rigidly connected to, and made electrically continuous with, roof conductors by means of pressure connectors or crimped joints of T-shaped malleable metal and connected to the air terminal by a dowel or threaded fitting. Air terminals at the ends of the structure shall be set not more than 2 feet from the ends of the ridge or edges and corners of roofs. Spacing of air terminals 2 feet in height on ridges, parapets, and around the perimeter of buildings with flat roofs shall not exceed 25 feet. In specific instances where it is necessary to exceed this spacing, the specified height of air terminals shall be increased not less than 2 inches for each foot

of increase over 25 feet. On large, flat or gently sloping roofs, as defined in NFPA 780, air terminals shall be placed at points of the intersection of imaginary lines dividing the surface into rectangles having sides not exceeding 50 feet in length. Air terminals shall be secured against overturning either by attachment to the object to be protected or by means of a substantial tripod or other braces permanently and rigidly attached to the building or structure. Metal projections and metal parts of buildings, smokestacks, and other metal objects that do not contain hazardous materials and that may be struck but not appreciably damaged by lightning, need not be provided with air terminals. However, these metal objects shall be bonded to the lightning conductor through a metal conductor of the same unit weight per length as the main conductor. [Where metal ventilators are installed, air terminals shall be mounted thereon, where practicable. Any air terminal erected by necessity adjacent to a metal ventilator shall be bonded to the ventilator near the top and bottom thereof.] Where nonmetallic spires, steeples, or ventilators are present, air terminals shall be mounted thereon or to the side. In addition, where spires or steeples project more than 10 feet above the building, the conductor between the air terminal [and metal roof] shall be continued to the nearest down conductor and securely connected thereto.

- b. Roof Conductors: Roof conductors shall be connected directly to the roof or ridge roll. Sharp bends or turns in conductors shall be avoided. Necessary turns shall have a radius of not less than 8 inches. Conductors shall preserve a downward or horizontal course and shall be rigidly fastened every 3 feet along the roof and down the building to ground. Metal ventilators shall be rigidly connected to the roof conductor at three places. All connections shall be electrically continuous. Roof conductors shall be coursed along the contours of flat roofs, ridges, parapets, and edges; and where necessary, over flat surfaces, in such a way as to join each air terminal to all the rest. Roof conductors surrounding tank tops, decks, flat surfaces, and flat roofs shall be connected to form a closed loop.
- Down Conductors: Down conductors shall be electrically continuous from c. air terminals and roof conductors to grounding electrodes. Down conductors shall be coursed over extreme outer portions of the building, such as corners, with consideration given to the location of ground connections and air terminals. Each building or structure shall have not less than two down conductors located as widely separated as practicable, at diagonally opposite corners. On rectangular structures having gable, hip, or gambrel roofs more than 110 feet long, there shall be at least one additional down conductor for each additional 50 feet of length or fraction thereof. On rectangular structures having French, flat, or sawtooth roofs exceeding 250 feet in perimeter, there shall be at least one additional down conductor for each 100 feet of perimeter or fraction thereof. On an L- or T-shaped structure, there shall be at least one additional down conductor; on an H-shaped structure, at least two additional down conductors; and on a wing-built structure, at least one additional down conductor for each wing. On irregularly shaped structures, the total number of down conductors shall be sufficient to make the average distance between them along the perimeter not greater than 100

feet. On structures exceeding 50 feet in height, there shall be at least one additional down conductor for each additional 60 feet of height or fraction thereof, except that this application will not cause down conductors to be placed about the perimeter of the structure at intervals of less than 50 feet. Additional down conductors shall be installed when necessary to avoid "dead ends" or branch conductors ending at air terminals, except where the air terminal is on a roof below the main protected level and the "dead end" or branch conductor is less than 16 feet in length and maintains a horizontal or downward coursing. Down conductors shall be equally and symmetrically spaced about the perimeter of the structure. Down conductors shall be protected where necessary, to prevent mechanical injury to the conductor.

- d. Interconnection of Metallic Parts: Metal doors, windows, and gutters shall be connected directly to the grounds or down conductors using not smaller than No. 6 copper conductor, or equivalent. Conductors placed where there is probability of unusual wear, mechanical injury, or corrosion shall be of greater electrical capacity than would normally be used, or shall be protected. The ground connection to metal doors and windows shall be by means of mechanical ties under pressure, or equivalent.
- e. Ground Connections: Ground connections comprising continuations of down conductors from the structure to the grounding electrode shall securely connect the down conductor and ground in a manner to ensure electrical continuity between the two. All connections shall be of the clamp type. There shall be a ground connection for each down conductor. Metal water pipes and other large underground metallic objects shall be bonded together with all grounding mediums. Ground connections shall be protected from mechanical injury. In making ground connections, advantage shall be taken of all permanently moist places where practicable, although such places shall be avoided if the area is wet with waste water that contains chemical substances, especially those corrosive to metal.
- Grounding Electrodes: NOTE: Where soil conditions indicate definitely that f. a counterpoise will not be required, all references to counterpoise should be deleted from the specifications. \&Using the soil resistance calculate the resistance of the ground rods. When these calculations indicate a combination of two ground rods will exceed 50 ohms or the system ground resistance will exceed [____] ohms, provide a counterpoise&\. A grounding electrode shall be provided for each down conductor located as shown. A driven ground shall extend into the earth for a distance of not less than 10 feet. \&Ground rods shall be set not less than 3 feet, nor more than 8 feet, from the structures foundation.&\ The complete installation shall have a total resistance to ground of not more than [____] ohms [if a counterpoise is not used]. \&Ground rods shall be tested individually prior to connection to the system and the system as a whole shall be tested not less than [24] [48] hours after rainfall. When the resistance of the complete installation exceeds the specified value or two ground rods individually exceed [____] ohms, the Owner's Representative will be notified immediately&\. A counterpoise, where required, shall be of No. 1/0 copper cable or equivalent material having suitable resistance to corrosion and shall be laid around the perimeter of the structure in a trench not less than 2 feet deep at a distance not less than

3 feet nor more than 8 feet from the nearest point of the structure. All connections between ground connectors and grounds or counterpoise, and between counterpoise and grounds shall be electrically continuous. Where so indicated on the drawings, an alternate method for grounding electrodes in shallow soil shall be provided by digging trenches radially from the building. The lower ends of the down conductors [or their equivalent in the form of metal strips or wires] are then buried in the trenches.

- 2. Metal Roofs: Wood-Frame, Wall-Bearing Masonry or Tile Structure with Metallic Roof and Nonmetallic Exterior Walls, or Reinforced Concrete Building with Metallic Roof: Metal roofs which are in the form of sections insulated from each other shall be made electrically continuous by bonding. Air terminals shall be connected to, and made electrically continuous with, the metal roof as well as the roof conductors and down conductors. Ridge cables and roof conductors shall be bonded to the roof at the upper and lower edges of the roof and at intervals not to exceed 100 feet. The down conductors shall be bonded to roof conductors and to the lower edge of the metal roof. Where the metal of the roof is in small sections, the air terminals and down conductors shall have connections made to at least four of the sections. All connections shall have electrical continuity and have a surface contact of at least 3 square inches.
- 3. Metal Roofs with Metal Walls: Wood-Frame Building With Metal Roof and Metal Exterior Walls: The metal roof and the metal walls shall be bonded and made electrically continuous and considered as one unit. The air terminals shall be connected to and made electrically continuous with the metal roof as well as the roof and down conductors. All connections shall have electrical continuity and have a surface contact of at least 3 square inches.
- Steel Frame Building: The steel framework shall be made electrically continuous. 4. Electrical continuity may be provided by bolting, riveting, or welding steel frame, unless a specific method is noted on the drawings. The air terminals shall be connected to the structural steel framework at the ridge. Short runs of conductors shall be used as necessary to join air terminals to the metal framework so that proper placing of air terminals is maintained. Separate down conductors from air terminals to ground connections are not required. \&Where a grounded metal pipe water system enters the building, the structural steel framework and the water system shall be connected at the point of entrance by a ground connector.&Connections to pipes shall be by means of ground clamps with lugs. Connections to structural framework shall be by means of nut and bolt or welding. All connections between columns and ground connections shall be made at the bottom of the steel columns. Ground connections to grounding electrons or counterpoise shall be run from not less than one-half of all the columns distributed equally around the perimeter of the structure \&at intervals averaging not more than 60 feet.
- 5. Ramps: Lightning protection for covered ramps (connecting passageways) shall conform to the requirements for lightning protection systems for buildings of similar construction, as hereinbefore described. A down conductor and a driven ground shall be placed at one of the corners where the ramp connects to each building or structure. This down conductor and driven ground shall be connected

to the counterpoise or nearest ground connection of the building or structure. Where buildings or structures and connecting ramps are clad with metal, the metal of the buildings or structures and metal of the ramp shall be connected in a manner to ensure electrical continuity, in order to avoid the possibility of a flash-over or spark due to a difference in potential.

- Igloo-Type Magazines: In earth-covered reinforced-concrete, igloo-type 6. magazines, the reinforcing steel shall be made electrically continuous. Electrical continuity may be provided by clipping or brazing, unless a specific method is noted on the drawings. The air terminals and roof conductors shall be securely connected to, and made electrically continuous with, the reinforcing steel. One air terminal shall be located on the top of the front wall and one on or adjacent to the ventilator in the rear. The air terminals shall extend vertically at least 2 feet above the top of the front wall and the highest point on the ventilator. Down conductors and grounding electrodes shall be provided at diagonally opposite corners of the magazine and shall be connected together. Grounding electrodes shall be connected to the horizontal reinforcing rods below the floor line of the wall system. The steel door frame shall be made electrically continuous with the reinforcing steel. The steel door shall be connected to the steel frame by means of a flexible copper strap or cable unless the steel hinges make the door and frame electrically continuous.
- 7. Tanks and Towers
 - Wooden Tanks and Towers: The lightning protection system shall consist of a. air terminals, ridge cables, down conductors, ground connections, and grounds, electrically interconnected to form the shortest distance to ground.&\ Where the roof of the structure ends in a peak, a single air terminal not less than 2 feet high will be regarded as sufficient. When the structure does not end in a peak, air terminals not less than 2 feet high shall be provided at intervals not exceeding 25 feet along the perimeter of the structure. When the tank or tower is an adjunct of a building, near or touching the perimeter, one of the down conductors shall be extended directly to a ground connection and the other shall be connected to the lightning protection system of the building. When tank or tower is set well within the perimeter of a building, both down conductors shall be connected to the lightning protection system of the building. \&When the height of the facility exceeds 60 feet, the down conductors shall be cross-connected at intermediate levels not exceeding 60 feet. Where buried metal pipes enter the tank or tower, one down connector shall be connected to the pipes, approximately 1 foot below grade. \&Metal guy wires or cables attached to steel anchor rods set in earth will be considered as grounded&\. Metal guy wires or cables set in concrete or attached to buildings or nonconducting supports shall be grounded to a ground rod driven full length into the ground.
 - b. Metal or Reinforced-Concrete Tanks and Towers: The metal or reinforcing steel shall be made electrically continuous. Electrical continuity may be provided by bolting, riveting, or welding metal and tying or clipping reinforcing bars, unless a specific method is noted on the drawings. Air terminals and down conductors are required except on bolted, riveted, or welded 3/16-inch minimum, steel plate tanks. Ground connections and

grounding electrodes are not required on metal tanks that are electrically continuous with a metallic underground pipe system. On other structures, two ground connections shall be provided approximately 180 degrees apart, at the base of the structure. Where buried metal pipes enter the tank or tower, one ground connection shall be connected to them, approximately 1 foot below finished grade. Metal guy wires on tanks and towers shall be grounded. Metal guy wires or cables attached to steel anchor rods set in earth will be considered as grounded. Metal guy wires or cables set in concrete or attached to buildings or nonconducting supports shall be grounded to a ground rod driven full length into the ground.

- 8. Stacks: Metal guy wires for stacks shall be grounded. Metal guy wires or cables attached to steel anchor rods set in the earth will be considered as sufficiently well grounded. However, metal guy wires or cables attached to anchor rods set in concrete or attached to buildings or nonconducting supports shall be grounded to a ground rod driven full length into the ground.
 - a. Metal Stacks: Metal smokestacks shall be electrically continuous and be grounded. Where the construction of the foundation is not such as to provide [____] ohms maximum to ground, the stack shall be grounded to two ground rods driven full length into the earth. \&Ground rods shall be located approximately 180 degrees apart and shall be set not less than 3 feet from the nearest point of the stack foundation.&\
 - b. Nonmetallic Stacks: On nonmetallic smokestacks constructed of brick, hollow tile, or concrete, the air terminals shall be made of solid copper, copper alloy, stainless steel or Monel metal. \&They shall be uniformly distributed about the rim of the stack at intervals not exceeding 8 feet and shall extend 18 to 30 inches above the stack if side mounted or 18 inches above the stack if top mounted. They shall be at least 5/8 inches in diameter, exclusive of the corrosion protection. Top-mounted air terminals shall not extend more than 18 inches above the top of the stack. &\ The air terminals shall be electrically connected together by means of a metal band or ring to form a closed loop about 2 feet below the top of the stack. Where the stack has a metal crown, the air terminals shall be connected thereto. Where stacks have a metal lining extending part way up, the lining shall be connected to the air terminal at its upper end and grounded at the bottom. At least two down conductors shall be provided on opposite sides of the stack leading from the ring or crown at the top to the ground. When the stack is an adjunct of a building near or touching the building perimeter, one of the down conductors shall be extended directly to a ground connection while the other may be connected to a lightning protection system on the building. On stacks exceeding 160 feet in height, the down conductors shall be crossconnected approximately midway between the top and the bottom. Joints in conductors shall be as few as practicable and of such construction as to provide strength in tension equal to that of the conductor. Fasteners of copper or copper-bronze alloy shall be spaced not over 3 feet apart for vertical conductors and not over 2 feet apart for horizontal conductors. To prevent corrosion by gases, copper air terminals, conductors, and fasteners within 25 feet of the top of the stack shall have a continuous covering of lead at least 1/16-inch thick. Stacks partly or wholly of reinforced concrete shall

conform to the requirements for nonmetallic stacks, and in addition, the reinforcing steel shall be electrically connected to down conductors at the top and bottom of the concrete.

- 9. Post Tensioning Systems: On construction utilizing post tensioning systems to secure precast concrete sections, the post tension rods shall not be used as a path for lightning to ground. Down conductors shall be provided on structures using post tensioning systems; down conductors shall have sufficient separation from post tension rods to prevent side-flashing. Post tension rods shall be bonded to the lightning protection and grounding systems only at the base of the structure; this bonding shall be performed in strict accordance with the recommendations of the post tension rod manufacturer, and shall be done by, or in the presence of, a representative of the manufacturer.&\
- B. Railroads: Rails that are not electrically continuous and rail switches shall be bonded together by means of flexible copper cable or straps for a distance of at least 100 feet on each side of structures in which explosives, ammunition, or explosive ingredients are stored, handled, manufactured, or processed. These rails shall also be grounded. Rails shall be grounded at points 150 feet on each side of overhead line crossings in excess of 600 volts and rails shall be bonded between grounds. At points where the tracks come within 25 feet of structures provided with a grounding system, such grounds shall be interconnected to the nearest rail. The cable used for the interconnection shall be at least 3/8-inch diameter or the same size as the conductors used on the structure. Isolation joints shall be installed in metal rails outside of hazardous areas to avoid stray currents being conducted into the bonded or grounded area.
- C. Piers and Wharves: Lightning protection systems for piers and wharves shall conform to the requirements hereinbefore specified for the type of construction involved.
- D. Interconnection of Metal Bodies: Metal bodies of conductance shall be protected if not within the zone of protection of an air terminal. All metal bodies of conductance having an area of 400 square inches or greater or a volume of 1000 cubic inches or greater shall be bonded to the lightning protection system using main size conductors and a bonding plate having a surface contact area of not less than 3 square inches. Provisions shall be made to guard against the corrosive effect of bonding dissimilar metals. Metal bodies of inductance shall be bonded at their closest point to the lightning protection system using secondary bonding conductors and fittings. A metal body that exceeds 5 feet in any dimension, that is situated wholly within a building, and that does not at any point come within 6 feet of a lightning conductor or metal connected thereto shall be independently grounded.
- E. Fences: Except as indicated below, metal fences that are electrically continuous with metal posts extending at least 2 feet into the ground require no additional grounding. Other fences shall be grounded on each side of every gate. Fences shall be grounded by means of ground rods every 1000 to 1500 feet of length when fences are located in isolated places, and every 500 to 750 feet when in proximity 100 feet or less) to public roads, highways, and buildings. [Where the fence consists of wooden posts and horizontal metal strands only, down conductors consisting of No. 8 copper wire or equivalent shall be run from the ground rod the full height of the fence and fastened to

each wire, so as to be electrically continuous.] The connection to ground shall be made from the post where it is of metal and is electrically continuous with the fencing. All metal fences shall be grounded at or near points crossed by overhead lines in excess of 600 volts and at distances not exceeding 150 feet on each side of line crossings.

- F. Exterior Overhead Pipe Lines: Overhead pipes, conduits, and cable tray that enter a building containing explosives shall be properly \&grounded&\ on the exterior of the building, preferably to the building \&grounds&\ at points where the pipes enter the building. Where a separate \&ground&\ is used, the pipes shall also be bonded to the building ground at points where the pipes are closest to the ground connections. In addition, the pipes shall be bonded to any metallic masses that are within 6 feet of the pipes.
- G. Separately Mounted Shielding System, Mast-Type: The mast-type protection shall consist of a pole, which, when of a nonconducting material, shall be provided with an air terminal mounted to the top, extending not less than 2 feet nor more than 5 feet above the top of the pole and a down conductor run down the side of the pole and connected to the ground rod. When a metal pole is used, the pole will act as a down conductor, and an air terminal need not be provided. Where the resistance of the pole to ground is [_____] ohms or less, additional grounding is unnecessary. Where the resistance exceeds [_____] ohms, additional grounding shall be provided, and the ground connection shall be fastened to the metal pole and the ground. When a ground rod is necessary, the rod shall be driven approximately 6 feet from the base of the pole. When the combined measured resistance to ground of the pole and ground rod exceeds [_____] ohms, the Owner's Representative will be notified immediately. The grounding system at the base of the pole shall be interconnected with any grounding system provided for the protected structure.
- Separately Mounted Shielding System, Overhead Ground-Wire Type: This type of H. protection shall consist of two or more poles electrically connected to each other by overhead conductors. Where the poles are made of a nonconducting material an air terminal shall be mounted to the top of each pole and shall extend not less than 2 nor more than 5 feet above the top of the pole. Down conductors shall be run down the side of the pole, or a guy wire may be used as a conductor. When the guy wire is used, the guy wire and the overhead ground wire shall be dead-ended at the pole. The overhead ground wire and the guy wire shall then be connected to each other by a separate cable using standard cable clamps in such manner that the discharge will not be reversed at any point. Guy wires used as down conductors shall be grounded by means of separate ground rods with cable connections clamped to the lower end of guy wire. Resistance to ground shall not exceed [____] ohms. Where metal poles are used, air terminals are not required and if resistance of the poles to ground is [____] ohms or less, additional grounding is unnecessary. Where the resistance to ground exceeds [____] ohms, additional grounding shall be provided and the ground connection shall be fastened to the metal pole and the ground. The height of the poles shall be sufficient to provide a clearance of not less than 6 feet between the overhead ground wire and the highest projection of the building. When the ground cable runs across and is used to protect stacks or vents that emit explosive dusts, vapors, or gases under forced draft, the cable shall have at least 15 feet clearance above the stack or vent. When grounding is required, a ground rod shall be driven approximately 6 feet from the base of each pole. \&When the combined measured resistance to ground of

the pole and ground rod exceeds [____] ohms, the Owner's Representative will be notified immediately. When a counterpoise is used, the entire system resistance requirement of [____] ohms or less need not be met&\.

I. Inspection: The lightning protection system will be inspected by the Owner's Representative to determine conformance with the requirements of this specification. No part of the system shall be concealed until so authorized by the Owner's Representative.

3.24 FIRE ALARM SYSTEM INSTALLATION – GENERAL

- A. Installation: All work shall be installed as shown and in accordance with the manufacturer's diagrams and recommendations, unless otherwise specified. [Smoke detectors shall not be installed until the building has been thoroughly cleaned.]
 - 1. Power Supply for the System: A single dedicated circuit connection for supplying power to each building fire alarm system shall be provided. The primary power shall be supplied as shown on the drawings. The power supply shall be equipped with a locking mechanism and marked "FIRE ALARM CIRCUIT CONTROL".
 - 2. Wiring: Conduit size for wiring shall be in accordance with NFPA 70. Wiring for the fire alarm system shall not be installed in conduits, junction boxes, or outlet boxes with conductors of lighting and power systems. No more than one conductor shall be installed under any screw terminal. All circuit conductors entering or leaving any mounting box, outlet box enclosure or cabinet shall be connected to screw terminals with each terminal marked in accordance with the wiring diagram. Connections and splices shall be made using screw terminal blocks. The use of wire nut type connectors are prohibited in the system. Wiring within any control equipment shall be readily accessible without removing any component parts. The fire alarm equipment manufacturer's representative shall be present for the connection of wiring to the control panel.
 - 3. Control Panel: The control panel and its assorted components shall be mounted so that no part of the enclosing cabinet is less than 12 inches nor more than 78 inches above the finished floor. All manually operable controls shall be between 36 inches to 42 inches above the finished floor. Panel shall be installed to comply with the requirements of UL 864.
 - 4. Detectors: Detectors shall be installed in accordance with NFPA 72. Detectors shall be at least 12 inches from any part of any lighting fixture. Detectors shall be located at least 3 feet from diffusers of air handling systems. Each detector shall be provided with appropriate mounting hardware as required by its mounting location. Detectors which mount in free space shall be mounted directly to the end of the stubbed down rigid conduit drop. Conduit drops shall be firmly secured to minimize detector sway. Where length of conduit drop from ceiling or wall surface exceeds 3 feet, sway bracing shall be provided.
 - 5. Notification Appliances: Notification appliances shall be mounted a minimum of 8 feet above the finished floor unless limited by ceiling height or otherwise indicated.

- 6. Annunciator Equipment: Annunciator equipment provided shall be mounted where indicated.
- B. Overvoltage and Surge Protection: All equipment connected to alternating current circuits shall be protected from surges per IEEE C62.41 and NFPA 70. All cables and conductors which serve as communications links, except fiber optics, shall have surge protection circuits installed at each end. Fuses shall not be used for surge protection.
- C. Grounding: Grounding shall be provided to building ground or ground rods shall be driven. Maximum impedance to ground shall be 25 ohms. Ground rods shall not protrude more than 6 inches above grade.
- D. Testing: The Contractor shall notify the Owner's Representative 30 days before the preliminary and acceptance tests are to be conducted. The tests shall be performed in accordance with the approved test procedures in the presence of the Owner's Representative. The control panel manufacturer's representative shall be present to supervise all tests. The Contractor shall furnish all instruments and personnel required for the tests.
 - 1. Preliminary Tests: Upon completion of the installation, the system shall be subjected to functional and operational performance tests [including tests of each installed initiating and notification appliance]. Tests shall include the meggering of all system conductors to determine that the system is free from grounded, shorted, or open circuits. The megger test shall be conducted prior to the installation of fire alarm equipment. If deficiencies are found, corrections shall be made and the system shall be retested to assure that it is functional.
 - 2. Acceptance Test: NOTE: Listed tests are minimum required. If additional tests are required, such tests must be added to the list. Testing shall be in accordance with NFPA 72. The recommended tests in NFPA 72 shall be considered mandatory and shall verify that all previous deficiencies have been corrected. The test shall include the following:
 - a. Test of each function of the control panel.
 - b. Test of each circuit in both trouble and normal modes.
 - c. Tests of alarm initiating devices in both normal and trouble conditions.
 - d. Tests of each control circuit and device.
 - e. Tests of each alarm notification appliance.
 - f. Tests of the battery charger and batteries.
 - g. Complete operational tests under emergency power supply.
 - h. Visual inspection of all wiring connections.
 - i. Opening the circuit at each alarm initiating device and notification appliance to test the wiring Construction Supervisory feature.
 - j. Ground fault
 - k. Short circuit faults
 - 1. Stray voltage
 - m. Loop resistance

E. Training: Training course shall be provided for the operations and maintenance staff. The course shall be conducted in the building where the system is installed or as designated by the Owner's Representative. The training period shall consist of [3]
 [____] training days (8 hours per day) and shall start after the system is functionally completed but prior to final acceptance tests. The instructions shall cover all of the items contained in the operating and maintenance instructions.

3.25 TELEPHONE COMPANY EMPTY CONDUIT SYSTEM

- A. Provide system of empty conduit, outlets and mounting boards.
- B. Non-metallic conduit may be used for telephone conduits in or under floor slabs and in other areas except ceilings used as air plena. EMT shall be used in ceiling air plena as required by codes and by telephone company and as shown on Drawings.
- C. Conduit runs shall be installed to meet requirements of telephone company and shall be sized as shown on Drawings.
- D. Nylon pull-in wire shall be installed in telephone conduits for use by telephone company.
- E. Provide power requirements such as duplex outlets and ground terminal connections, as required by telephone company and as shown on Drawings.
- F. Sleeves between floors in telephone closets shall terminate 3" above finished floor. Provide bushings. Fireproof sleeves after cables will be installed by telephone company.
- G. Cable tray shall be installed above ceilings in large open spaces as shown on Drawings for main cable routing. Outlets at work stations in open areas shall be fed from overhead down power poles or flexible hoses. Outlets on fixed walls shall be fed with 3/4" conduit from above suspended ceiling.
- H. Consult telephone company regarding service requirements. Coordinate main service requirement and pay Telephone Company backcharges.

3.26 LIGHTING CONTROL SYSTEM INSTLALLATION

- A. The control system shall be installed and fully wired as shown on the plans. Complete all electrical connections to all control circuits, network terminations, RS-232 connections, sensors and override wiring.
- B. Telephone Lines
 - 1. Arrange for all telephone lines that are needed for telecommunications and touchtone telephone override wiring as denoted on the plans. All phone connections shall be terminated into RJ-11 modular telephone. If multiple lines are required, they shall be installed on a rotating line so when one line is busy the call will automatically switch to the next line.
- C. Documentation

- 1. Provide accurate "as built" drawings to the owner for correct programming and proper maintenance of the control system. The "as builts" shall indicate the load controlled by each relay and the relay panel number.
- D. Operation and Service Manuals
 - 1. The factory shall supply all operation and service manuals as related to the design of the control system.
- E. Product Support and Service
 - 1. System Start-up
 - a. Before requesting for factory start-up services, the installing contractor shall verify that:
 - 1) The control system has been fully installed in accordance with manufacturer's installation instructions.
 - 2) Phone lines have been checked for dial tone.
 - 3) All low voltage wiring for overrides and sensors is completed.
 - 4) All "as builts" that describe relay load locations are delivered to the owner.
 - b. Factory Support
 - 1) Factory telephone support shall be available at no cost to the owner. Factory assistance shall consist of solving programming or application questions concerning the control equipment. The factory shall maintain toll-free numbers for technical support for their customers.
- F. System Delivery and Acceptance: he contractor is responsible for complete installation of the system according to strict factory standards and requirements. The following shall be included requirements:
 - 1. All system equipment shall operate in accordance with specification and industrial standard procedures.
 - 2. An operational user program shall exist in the control system. The program shall execute and perform all functions required to effectively operate the site according to the requirements herein.
 - 3. Demonstration of program integrity during normal operation and pursuant to a power outage.
- G. Warranty:
 - 1. Manufacture shall supply a one-year warranty on all hardware and software. A limited 10-year warranty shall be provided on the individual relays.
 - 2. The manufacturer shall provide a one year, no cost technical support service to the Authority. The manufacturer shall provide a toll free telephone number, with 8 hour per day, 5 days per week (minimum) technical support. There shall be no costs to the Authority for any system technical support for this period.

H. Training

- 1. Provide a training session for up to 20 Authority's representatives for 1/2 normal workday at the jobsite or other office location chosen by the Authority.
- 2. The training session shall be conducted by a manufacturer's qualified representative.
- 3. The training program shall consist of the following:
 - a. Review of the one-line drawings and schedules.
 - b. Review of the factory record shop drawings and placement of the various components.
 - c. Review of each piece of equipment, components within, control and power wiring.
- 4. Review component replacement, and component replacement procedures.
- 5. Discuss the maintenance timetable and procedures to be followed in an ongoing maintenance program.
- 6. Provide three ring binders to participants complete with copies of drawings and other course material covered.
- 7. Full operation of the unit, under any and all operating conditions.

3.27 GENERAL TESTING, INSPECTION AND CLEANING

- A. Test and inspect work provided under this Section as required by Contract Documents, codes, standards and authorities that have jurisdiction, to satisfaction of Owner's Representative. Notify Owner's Representative and authorities at least 48 hours before testing or inspection. Do not cover work before testing or inspection.
- B. Furnish Owner's Representative with certificates of testing and inspection for electrical systems, indicating approval of authorities that have jurisdiction and conformance with requirements of Contract Documents.
- C. Test wiring and connections for continuity and grounds before fixtures are connected; demonstrate insulation resistance by megger test as required. Insulation resistance between conductors and grounds for secondary distributions systems shall meet NEC requirements.
- D. Verify and correct as necessary: voltages, tap settings, trip settings and phasing on equipment from secondary distribution system to points of use. Test secondary voltages at bus in main switchboard, at panelboards, and at other locations on distribution systems as necessary. Test secondary voltages under no-load and full-load conditions.
- E. Test lighting fixtures with specified lamps in place for 10 hours; check fixtures in sections. Do not operate lamps other than for testing before final inspection by Owner's Representative. Replace lamps that fail within 90 days after acceptance by Owner's Representative within Contract Price.

- F. Provide necessary testing equipment and testing.
- G. Failure or defects in workmanship or materials revealed by tests or inspection shall be corrected promptly and retested. Replace defective material.
- H. Perform high potential DC test on 15 kV equipment and cable as specified and as required by local electric company. Provide services of approved independent testing company, in presence of Owner's Representative, Owner and local electric company.
- I. Clean switchboard, panels, generator and other equipment. Panelboard interiors shall be cleaned and vacuumed. Equipment with damage to painted finish shall be repaired to Owner's Representative's satisfaction.
- J. Equipment
 - 1. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

END OF SECTION 260000

HAZARDOUS BUILDING MATERIALS REPORT

RECC Building 2 Coppage Drive Worcester, Massachusetts

2014



Prepared For:

The City of Worcester 455 Main Street Worcester, MA



Environmental Consulting 20 Island Pond Road Derry, NH 03038 Serving the Environmental Needs of Clients throughout New England!



Certification of Field Activities

ACM Audit

| | Site Location: | RECC Building 2 Coppage Drive Worcester, MA | | | |
|--------------------|------------------|--|--|--|--|
| | Conducted By: | Mr. Stephen Powell | | | |
| | Title: | Project Manager | | | |
| | License: | MA Asbestos Inspector DLS #: 061750, Expiration 9/11/14 | | | |
| | | I hereby certify that sampling and analyses have been conducted pursuant to EPA NESHAP, OSHA 1926.1101 and MA DLS 453 CMR 6.0 regulations and accurately represents the conditions in the areas tested on this date | | | |
| | Asbestos Hazards | | | | |
| | Identified: | Yes | | | |
| | Signature: | - All | | | |
| | Dates: | August 7 th , 2014 | | | |
| Report Preparation | | | | | |
| | Prepared By: | Mr. Stephen Powell | | | |
| | Title: | Project Manager | | | |
| | Dates: | August 14 th , 2014 | | | |
| <u>QC / Review</u> | | | | | |
| | | | | | |

Reviewed By:

Mr. Allen Grinnell

Title:

General Manager

Dates:

Signature:

August 14th, 2014

Hazardous Building Materials Survey 2 Coppage Drive-Worcester Massachusetts ALG Job # 14-073 ΔLG

Table of Contents

| 1 | EXECUTIVE SUMMARY4 |
|--------|---|
| 2 | SITE DESCRIPTION2 |
| 3 | ASBESTOS BUILDING MATERIALS SURVEY |
| 3.1 | The Intent of the Survey |
| 3.2 | Limitations of Survey |
| 3.3 | Asbestos and Other Environmental Reports |
| 3.4 | Sampling Methodology |
| 3.5 | Qualification of Consultants, Laboratories, and Analytical Methodology: |
| 3.6 | Summary of Findings |
| 3 3 | .6.1Summary Tables of Suspect Asbestos Containing Materials Tested5.6.2Summary Tables of Asbestos Containing Materials7 |
| 3.7 | Conclusions and Recommendations:7 |
| 4 | INVENTORY OF MISCELLANEOUS HAZARDOUS MATERIALS8 |
| 4.1 | Summary of Miscellaneous Hazardous Materials |
| 4 | .1.1 Hazardous Materials – RECC Building |
| 5 | APPENDICES10 |
| 5.1 | Appendix A: Laboratory Sample Analytical Results11 |
| 5 | .1.1 RECC Building Bulk Sample Results Error! Bookmark not defined. |
| 5.2 | Appendix B: Inspector Qualifications |
| 5.3 | Appendix C: Laboratory Certifications |

1 Executive Summary

ALG Environmental Consulting LLC (ALG) was retained by the City of Worcester to conduct a pre-renovation / demolition hazardous building materials survey for asbestos containing building materials, universal wastes and other misc. hazardous materials of the RECC Building at 2 Coppage Drive in Worcester, Massachusetts. Mr. Stephen Powell of ALG Environmental Consulting, LLC (ALG) conducted the on-site investigation on August 7th, 2014.

The intent of the hazardous materials investigation was to:

- 1. Specifically identify, locate and quantify all accessible Regulated Asbestos Containing Building Materials (RACM) pursuant to the requirements of the Environmental Protection Agency (EPA), National Emissions Standards for Hazardous Air Pollutants (NESHAPS) regulation Title 40 CFR Part 61.145.
- 2. Identify building surfaces coated with lead based paint.
- 3. Create an inventory of miscellaneous hazardous materials and universal wastes.

The survey <u>did</u> indicate the presence of asbestos containing materials. During the asbestos investigation, a total of 30 suspect asbestos containing materials were identified and 2 were found to contain asbestos including:

Materials that tested positive included:

- Silver Coat Roof Cement
- Door Caulking

A total of 64 samples were collected and 64 samples were analyzed for the presence of asbestos. A detailed listing of ACMs including locations and quantities can be found in Table 3.6.2

The hazardous materials inventory found a number of universal wastes & hazardous materials including but not limited to; fluorescent light bulbs and light ballasts, mercury switches, lead acid batteries, fire extinguishers, cleaning compounds, smoke detectors, unknown liquids, oils, refrigerants and switchgear. A detailed listing of items can be found in Section 5.0.

The information contained in this report summarizes the sampling and analytical methodologies, site description, materials found to contain asbestos, quantities, sample results and qualifications of personnel.

2 Site Description

The RECC Building surveyed is located at 2 Coppage Drive in Worcester, Massachusetts.

The Building was constructed in the early 1980's.

Interior finishes within the Building surveyed at the Site consist of vinyl tile flooring; carpeting and bare cement floors, Wood and Metal stud gypsum walls and steel walls with acoustical ceiling tiles and fiberglass insulation.

The exterior of the Building is metal with metal window/door systems and lintels.

The Building's roof was included in this survey and is an interlocking metal panel roof system.

ΔLG

3 Asbestos Building Materials Survey

3.1 The Intent of the Survey

The intent of the asbestos survey was to specifically identify, locate and quantify all accessible RACM pursuant to the requirements of the EPA NESHAPS regulation Title 40 CFR Part 61.145. NESHAPS requires, prior to demolition, the removal and disposal of friable asbestos containing building materials or those materials that will become friable as a result of demolition or renovation.

3.2 Limitations of Survey

A semi-destructive limited survey was conducted. ALG made a reasonable attempt to ascertain the presence of suspect asbestos containing materials in wall cavities and pipe chases but provides no guarantee all such spaces were accessed. All other areas of the planned work zone were accessed during the survey with the exception of: any buried piping networks that may exist outside the building and run through the property; pipe chases and electrical switchgear.

It is recommended that should any suspect material become evident or discovered during renovation or demolition activities, that the activities be stopped, until samples of the suspect materials are collected by a licensed asbestos inspector and analyzed for asbestos content.

The conditions and estimated quantities as herein stated of all areas and materials are based upon field observations made at the time of the inspection.

ALG makes no representation with regard to subsurface and or latent conditions. The interiors of walls and or chases were not inspected or sampled. Roof sampling was **NOT** conducted as part of this survey. ALG did not take soil samples and makes no representation as to whether or not buried suspect asbestos containing materials exist on the site.

3.3 Asbestos and Other Environmental Reports

No reports or documentation of the presence of asbestos or stored hazardous materials were available for this project.

3.4 Sampling Methodology

ALG's survey methods were designed so that suspect ACM was identified and sampled in accordance with the EPA's AHERA (Asbestos Hazard Emergency Response Act) regulations and OSHA 29 CFR Part 1926.1101 Occupational Exposure to Asbestos (Construction Industry Standard). These regulations provide methods, which are considered "state-of-the-art" for the asbestos industry. Our survey involved several 'Walkthroughs" of the building to identify, quantify and sample homogeneous applications of suspect ACM throughout the facility. All sampling of suspect asbestos containing materials were sampled in accordance with the AHERA protocols set forth in 40 CFR Part 763.85. The AHERA standard classifies all suspect material into three categories; surfacing materials, thermal system insulation and miscellaneous materials.

The AHERA standard also specifies and provides guidance on the number of samples taken for each homogeneous area depending on the category the material is classified in:

- Surfacing materials require random sampling. The total number of samples collected is based on the square footage of the material. A minimum of 3 samples is taken for amounts between 0 and 1,000 SF, 5 samples are taken for amounts between 1,000 and 5,000 SF and 7 samples are taken for amounts greater than 5,000 SF. A total of 9 samples, for each homogenous surfacing material, are recommended by the standard.
- Thermal system insulation requires 3 samples per each homogeneous area or 1 per patched area less than 6 LF.
- Miscellaneous materials require the inspector to take enough samples of each homogeneous area to be representative. Typically ALG will collect a minimum of two samples to generate statistically reliable data.

ALG identified 30 suspect homogeneous materials in the areas of the structure surveyed. All surfacing materials, thermal system insulation and miscellaneous materials were sampled. A total of 64 samples were collected and 64 samples were analyzed for the presence of asbestos.

The inspector also assessed friability and condition of the material during the sampling phase of the survey.

A listing of the laboratory analytical results can be found in Appendix A.

3.5 *Qualification of Consultants, Laboratories, and Analytical Methodology:*

The hazardous building material survey was conducted on August 7th, by Mr. Stephen Powell, licensed by the State of Massachusetts Department of Labor and Workforce Development as an asbestos inspector (DLS license number AI 61750). Please refer to Appendix B, ALG Environmental Consulting LLC, and Staff Accreditation Certificates for evidence of the required training and certification credentials.

The samples collected were couriered directly to Carolina Environmental Inc. at 107 New Edition Court in Cary, North Carolina for analysis on August 8th, 2014 and were analyzed by August 12th, 2014.

Bulk samples collected during the inspection were analyzed by Carolina Environmental Inc. who is fully accredited for bulk sample analysis under the National Voluntary Laboratory Accreditation Program (NVLAP) administered by the National Institute of Standards and Technology (NIST). Copies of the lab's NIST (NVLAP) accreditation certificates are included herein. The lab is licensed by the State of Massachusetts DLS. A copy of Asbestos Identification's Laboratory Services accreditation certificates can be found in Appendix C. All bulk samples were analyzed for asbestos content using EPA Method 600/M4-82-020: "Interim Method for the Determination of Friable Asbestos in Bulk Insulation Samples".

Carolina Environmental Inc's quality assurance and control program was developed in strict compliance with NIST/NVLAP requirements and involves the following key components: 1) use of established or standard sampling and analytical methodologies; 2) continuous monitoring of the operational performance of the laboratory; and 3) periodic evaluation of the performance and analytical variability of each laboratory analyst.

All samples are carefully handled and stored as to assure their integrity. Bulk samples are routinely retained for a period of 90 days after results are reported to allow for any required analytical follow-up and/or reanalysis. If you wish to retain the bulk samples, please notify ALG Environmental Consulting, LLC within ten days.

Samples identified with asbestos are considered positive when they contain greater than 1 percent asbestos by volume. These samples are then classified as asbestos containing material.

Individual laboratory sample results can be found in Appendix A. Specific information on the laboratory certifications can be found in Appendix D.

3.6 Summary of Findings

The tables found in section 3.6.1 summarizes the suspect homogeneous materials identified at the subject property that was sampled for the presence of asbestos.

The tables found in Section 3.6.2 summarize those materials, which tested positive for the presence of asbestos or were assumed positive by the inspector.

The chain of custodies and analytical results for all bulk samples analyzed for the presence of asbestos can be found in Appendix-A.

3.6.1 Summary Table of Suspect Asbestos Containing Materials Tested

The following *suspect materials* at the Fellsway Plaza were identified by the inspector; sampled and analyzed for the presence of asbestos:

ΔLG

| Homo. Mat. ID. | Material Category | Type of Material | Color | Location | Comment |
|-------------------|----------------------|--------------------------|--------|-------------------------------|-------------------|
| SR 1 | Surfacing | Sheet Rock | Gray | Throughout | |
| JC 1 | Surfacing | Joint Compound | White | Throughout | |
| FT1 | Misc | Floor Tile | White | Bathrooms | |
| FT1A | Misc | Mastic | Tan | Bathrooms | |
| FT2 | Misc | Floor Tile | Beige | Lg Meeting Room | |
| FT2A | Misc | Mastic | Tan | Lg Meeting Room | |
| FT3 | Misc | Floor Tile | White | Lobby & Offices | Under Carpet |
| FT3A | Misc | Mastic | Tan | Lobby & Offices | Under Carpet |
| FT4 | Misc | Floor Tile | Brown | Bathroom | |
| FT5 | Misc | Floor Tile | Gray | Rear Office | |
| CT1 | Misc | 2x4 Ceiling Tile | White | Throughout Office Area | |
| CA1 | Misc | Carpet Adhesive | Yellow | Throughout Office Area | |
| CBA1 | Misc | Cove Base Adhesive | Yellow | Throughout Office Area | |
| Misc1 | Misc | Floor Levelastic | White | Hall Office | |
| Misc2 | Misc | Ceramic Tile Grout | Gray | Lg Bathroom | |
| Misc3 | Misc | Ceramic Tile Thin Set | White | Lg Bathroom | |
| DC1 | Misc | Door Caulking | Brown | Exterior | |
| DC2 | Misc | Door Caulking | White | Exterior | Loading Dock |
| WC1 | Misc | Window Caulking | Brown | Exterior | |
| WC2 | Misc | Window Caulking | Gray | Exterior | |
| RC1 | Roofing | Roof Cement | Silver | Parapet Base & Screw Daubs | Tall Parapet Side |
| RC2 | Roofing | Roof Cement | Gray | Roof Panel Seams | |
| RC3 | Roofing | Roof Cement | Black | Blower Penetration | |
| RC4 | Roofing | Roof Cement | Black | Pipe Penetration | |
| RC5 | Roofing | Roof Cement | Gray | Pipe Penetration | |

3.6.1.1 Suspect Asbestos Containing Materials – RECC Building, Worcester MA

| Homo. Mat. ID. | Material Category | Type of Material | Color | Location | Comment |
|-------------------|----------------------|---------------------|-------|---------------------------|------------|
| RC6 | Roofing | Roof Cement | Black | Patch Areas | |
| RC7 | Roofing | Roof Cement | Black | Air Handler Duct | |
| RS1 | Roofing | Sealant | White | Under Roof Panel Edges | |
| SS1 | Roofing | Sealant | Tan | Parapet Cap Seams | Tall Side |
| SS2 | Roofing | Sealant | Gray | Parapet Cap Seams | Short Side |

3.6.2 Summary Tables of Asbestos Containing Materials

The following materials were found to contain asbestos based on laboratory analysis or were assumed positive by the inspector.

| 5.0.2.1 Alsocsios Comuning Mulchuis, - RECC Dunuing, Horcester MA | | | | | |
|---|--------------|-------------------|----------------------------|--|--------------------|
| Homogenous Material ID | Mat. Type | Friable Y or N | Description | Material Location/ Quantity | % Asbestos Type |
| DC1 | Misc | N | Door Caulking | 2 Exterior Metal Doors 24 Ln Ft | 2% Chrysotile |
| RC1 | Roofing | N | Silver Coat Roof Cement | Base of Parapet Wall 110 Ln Ft & 20 Daubs on Roof Screws | 3% Chrysotile |

Please note: All material quantities are approximations based on a field review of the locations where asbestos containing material haves been identified. Any person using these material quantifications for cost estimating is responsible measuring and determining to their satisfaction the quantities of asbestos containing materials detailed in this report.

3.7 Conclusions and Recommendations:

Asbestos containing materials were identified in the building that are will be impacted by the planned demolition activities.

Prior to the planned demolition of the surveyed building, an asbestos removal contractor licensed by the State of Massachusetts Division of Occupational Safety should remove the asbestos containing materials. Contractors must be informed of the results of this survey as part of the demolition process and it is also a requirement of the demolition permitting.

The NESHAPS regulations require that the following types of materials be removed from a facility to be demolished before any activity begins that would break up, dislodge, or disturb the material: (1) all RACM, (2) Category I Nonfriable ACM (that is friable or in

poor condition), and (3) Category 11 Nonfriable ACM with high probability that the materials will become friable during demolition activities.

All identified ACM that is: (1) friable, (2) is likely to be rendered friable, or (3) can not be removed reasonably intact by the planned demolition process (note: asbestos containing roofing materials can typically be removed intact with minimal requirements as part of the building demolition process), must be removed in accordance With Federal and State of Massachusetts DLS regulations which require that the materials be removed by a licensed asbestos abatement contractor prior to demolition work.

Many times during building surveys, materials are identified as containing < 1% asbestos, or "trace." These materials are commonly defined as "non ACM" by the consulting firm and therefore allowed to remain during demolition. The problem with this common practice, however, may possibly lead to violations and liability problems. Many building materials are sent off to a recycling facility rather than a sanitary landfill. If routine sampling and laboratory analysis at the recycling facility reveals asbestos, the facility may loose its permit, thus imposing a liability issue. It is therefore important not to dismiss materials noted with trace amounts on the laboratory report. At a minimum, it should be made clear to demolition contractors that the building contains materials with trace amounts of asbestos in order for them to properly manage these materials.

If additional suspect materials are identified in the course of the planned demolition activities, all work should cease until such time as a licensed asbestos inspector can collect bulk samples for analysis.

4 Inventory of Miscellaneous Hazardous Materials

4.1 Summary of Miscellaneous Hazardous Materials

The tables of 4.1 summarize the miscellaneous hazardous materials present inside the buildings that were readily apparent to the Asbestos Inspector during his walkthrough and Inspection. ALG makes no representation that this listing is comprehensive or complete in its scope. Additional testing may be required to determine whether or not light ballasts, transformers or building caulkings contain Poly-Chlorinated Biphenyls (PCBs).

| Hazardous Material | Amount | Location | Comment |
|-------------------------------|--------|------------|--|
| Thermostats | 4 | Throughout | Possible Mercury Source |
| Fluorescent light ballasts | 81 | Throughout | Possible PCB Source |
| Fluorescent light Tubes | 162 | Throughout | Mercury Source |
| Exit sign | 10 | Throughout | Lead / Acid Batteries |
| Fire extinguishers | 8 | Throughout | Monoammonium Phosphate and Ammonium Sulfate |

4.1.1 Hazardous Materials – Former CW Price Store

ALG

Inspector Observations:

No hazardous chemical storage areas were observed by the inspector.

Prior to demolition or renovation of the structures, the above listed materials should be collected, packaged and disposed of by a qualified hazardous materials contractor.

5 Appendices

- 5.1 Appendix A Laboratory Analytical Results
- 5.2 Appendix B Inspector Qualifications
- 5.3 Appendix C Laboratory Certifications

5.1

Appendix A: Laboratory Sample Analytical Results

ΔLG

5.1.1 RECC Building
| Δ | LC |
|---|----|
| 4 | |

| ASBES | TOS LA | BORATORY R | EPORT |
|------------------|-----------|----------------|---------|
| | P | Prepared for | |
| ALG E | nvironm | ental Consulti | ng, LLC |
| PROJECT: | 11-073 | | |
| CEI LAB CODE: | A14-11069 | | |
| DATE ANALYZED: | 08/11/14 | | |
| DATE REPORTED: | 08/12/14 | | |
| TOTAL SAMPLES A | NALYZED: | 64 | |
| # SAMPLES >1% AS | SBESTOS: | 4 | |
| | | | |



Asbestos Report Summary By: POLARIZING LIGHT MICROSCOPY

PROJECT: 11-073

CEI LAB CODE: A14-11069

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

| Client ID | Layer | Lab ID | Color | Sample Description | ASBESTOS % |
|-----------|-------|-----------|-----------|--------------------|---------------|
| SR1-01 | | A1794480 | Off-white | Sheetrock | None Detected |
| SR1-02 | | A1794481 | Off-white | Sheetrock | None Detected |
| SR1-03 | | A1794482 | Off-white | Sheetrock | None Detected |
| SR1-04 | | A1794483 | Off-white | Sheetrock | None Detected |
| SR1-05 | | A1794484 | Off-white | Sheetrock | None Detected |
| JC1-01 | | A1794485 | White | Joint Compound | None Detected |
| JC1-02 | | A1794486 | White | Joint Compound | None Detected |
| JC1-03 | | A1794487 | White | Joint Compound | None Detected |
| JC1-04 | | A1794488 | White | Joint Compound | None Detected |
| JC1-05 | | A1794489 | White | Joint Compound | None Detected |
| FT1-01 | | A1794490 | White | Floor Tile | None Detected |
| FT1-02 | | A1794491 | White | Floor Tile | None Detected |
| FT1A-01 | | A1794492 | Tan | Mastic | None Detected |
| FT1A-02 | | A1794493 | Tan | Mastic | None Detected |
| FT2-01 | | A1794494 | Beige | Floor Tile | None Detected |
| FT2-02 | | A1794495 | Beige | Floor Tile | None Detected |
| FT2A-01 | | A1794496 | Tan | Mastic | None Detected |
| FT2A-02 | | A1794497 | Tan | Mastic | None Detected |
| FT3-01 | | A1794498 | White | Floor Tile | None Detected |
| FT3-02 | | A1794499 | White | Floor Tile | None Detected |
| FT3A-01 | | A1794500 | Tan | Mastic | None Detected |
| FT3A-02 | | A1794501 | Tan | Mastic | None Detected |
| FT4-01 | | A1794502A | Brown | Floor Tile | None Detected |
| | | A1794502B | Tan | Mastic | None Detected |
| FT4-02 | | A1794503A | Brown | Floor Tile | None Detected |
| | | A1794503B | Tan | Mastic | None Detected |
| FT5-01 | | A1794504A | Gray | Floor Tile | None Detected |
| | | A1794504B | Yellow | Mastic | None Detected |
| FT5-02 | | A1794505A | Gray | Floor Tile | None Detected |
| | | A1794505B | Yellow | Mastic | None Detected |
| CT1-01 | | A1794506 | White | Ceiling Tile | None Detected |

Page 1 of 3



Asbestos Report Summary By: POLARIZING LIGHT MICROSCOPY

PROJECT: 11-073

CEI LAB CODE: A14-11069

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

| CT1-02 A1794507 White Ceiling Tile None Detected CA1-01 A1794508 Yellow Carpet Adhesive None Detected CA1-02 A1794509 Yellow Carpet Adhesive None Detected CBA1-01 A1794510 Yellow Corebase Adhesive None Detected CBA1-02 A1794511 Yellow Covebase Adhesive None Detected CBA1-01 Layer 1 A1794512 Yellow Adhesive None Detected Misc1-01 Layer 2 A1794513 Yellow Adhesive None Detected Misc2-01 A1794513 Yellow Adhesive None Detected Misc3-01 A1794514 Dark Grey Ceramic Tile Grout None Detected Misc3-01 A1794516 Off-white Door Caulking Chrysotile 2% DC1-02 A1794516 Brown, White Door Caulking None Detected DC2-01 A1794517 Brown, White Door Caulking None Detected WC1-02 A1794518 Off-white Door Caulking None Detected WC2-02 A1794520 Dark B | Client ID | Layer | Lab ID | Color | Sample Description | ASBESTOS % |
|---|-----------|---------|----------|--------------------|----------------------|---------------|
| CA1-01 A1794508 Yellow Carpet Adhesive None Detected CA1-02 A1794509 Yellow Carpet Adhesive None Detected CBA1-01 A1794510 Yellow Corpetsase Adhesive None Detected CBA1-02 A1794511 Yellow Covebase Adhesive None Detected Misc1-01 Layer 1 A1794512 White Leveling Compound None Detected Misc1-02 Layer 2 A1794513 Yellow Adhesive None Detected Misc2-01 A1794513 Yellow Adhesive None Detected Misc2-01 A1794514 Dark Grey Ceramic Tile Grout None Detected Misc3-01 A1794516 Off-white Coor Caulking Chrysotile 2% DC1-01 A1794516 Brown, White Door Caulking None Detected DC2-02 A1794518 Off-white Door Caulking None Detected WC1-01 A1794520 Dark Brown Window Caulking None Detected WC1-02 A1794521 Dark Brown Window Caulking None Detected WC2-01 A1794523 <td>CT1-02</td> <td></td> <td>A1794507</td> <td>White</td> <td>Ceiling Tile</td> <td>None Detected</td> | CT1-02 | | A1794507 | White | Ceiling Tile | None Detected |
| CA1-02 A1794509 Yellow Carpet Adhesive None Detected CBA1-01 A1794510 Yellow Covebase Adhesive None Detected CBA1-02 A1794511 Yellow Covebase Adhesive None Detected Misc1-01 Layer 1 A1794512 Yellow Adhesive None Detected Misc1-01 Layer 2 A1794513 Yellow Adhesive None Detected Misc1-02 Layer 2 A1794513 Yellow Adhesive None Detected Misc2-01 A1794513 White Leveling Compound None Detected Misc3-01 A1794514 Dark Grey Ceramic Tile Grout None Detected DC1-01 A1794516 Brown, White Door Caulking Chrysotile 2% DC1-02 A1794516 Brown, White Door Caulking None Detected DC2-01 A1794519 Off-white Door Caulking None Detected DC2-02 A1794519 Off-white Door Caulking None Detected WC1-01 A1794520 Da | CA1-01 | | A1794508 | Yellow | Carpet Adhesive | None Detected |
| CBA1-01 A1794510 Yellow Covebase Adhesive None Detected CBA1-02 A1794511 Yellow Covebase Adhesive None Detected Misc1-01 Layer 1 A1794512 Yellow Adhesive None Detected Layer 2 A1794512 White Leveling Compound None Detected Misc1-02 Layer 1 A1794513 Yellow Adhesive None Detected Misc2-01 A1794513 Yellow Adhesive None Detected Misc3-01 A1794514 Dark Grey Ceramic Tile Grout None Detected DC1-01 A1794516 Brown, White Door Caulking Chrysotile 2% DC1-02 A1794517 Brown, White Door Caulking None Detected DC2-01 A1794518 Off-white Door Caulking None Detected UC2-02 A1794519 Off-white Door Caulking None Detected UC2-02 A1794520 Dark Brown Window Caulking None Detected WC2-01 A1794523 Gray Wi | CA1-02 | | A1794509 | Yellow | Carpet Adhesive | None Detected |
| CBA1-02 A1794511 Yellow Covebase Adhesive None Detected Misc1-01 Layer 1 A1794512 Yellow Adhesive None Detected Misc1-02 Layer 2 A1794513 Yellow Adhesive None Detected Misc1-02 Layer 1 A1794513 Yellow Adhesive None Detected Misc2-01 A1794513 White Leveling Compound None Detected Misc3-01 A1794515 Off-white Ceramic Tile Grout None Detected DC1-01 A1794515 Off-white Coralking Chrysotlie 2% DC1-02 A1794517 Brown, White Door Caulking None Detected DC2-01 A1794518 Off-white Door Caulking None Detected WC1-01 A1794512 Dark Brown Window Caulking None Detected WC2-02 A1794512 Dark Brown Window Caulking None Detected WC2-01 A1794523 Gray Window Caulking None Detected WC2-02 A1794524 Silver< | CBA1-01 | | A1794510 | Yellow | Covebase Adhesive | None Detected |
| Misc1-01 Layer 1 A1794512 Yellow Adhesive None Detected Layer 2 A1794512 White Leveling Compound None Detected Misc1-02 Layer 1 A1794513 Yellow Adhesive None Detected Misc1-02 Layer 2 A1794513 Yellow Adhesive None Detected Misc2-01 A1794514 Dark Grey Ceramic Tile Grout None Detected Misc3-01 A1794515 Off-white Ceramic Tile Thinset None Detected DC1-01 A1794516 Brown, White Door Caulking Chrysotlie 2% DC1-02 A1794517 Brown, White Door Caulking None Detected DC2-01 A1794518 Off-white Door Caulking None Detected WC1-01 A1794520 Dark Brown Window Caulking None Detected WC2-02 A1794523 Gray Window Caulking None Detected WC2-02 A1794524 Silver Roof Cernent Chrysotlie 3% RC1-01 A1794525 S | CBA1-02 | | A1794511 | Yellow | Covebase Adhesive | None Detected |
| Layer 2 A1794512 White Leveling Compound None Detected Misc1-02 Layer 1 A1794513 Yellow Adhesive None Detected Misc2-01 A1794513 White Leveling Compound None Detected Misc2-01 A1794514 Dark Grey Ceramic Tile Grout None Detected Misc3-01 A1794515 Off-white Ceramic Tile Thinset None Detected DC1-01 A1794516 Brown, White Door Caulking Chrysotlie 2% DC1-02 A1794517 Brown, White Door Caulking None Detected DC2-01 A1794518 Off-white Door Caulking None Detected WC1-01 A1794520 Dark Brown Window Caulking None Detected WC2-01 A1794521 Dark Brown Window Caulking None Detected WC2-01 A1794523 Gray Window Caulking None Detected WC2-02 A1794524 Silver Roof Cement Chrysotlie 3% RC1-01 A1794525 Silver Roof Cement | Misc1-01 | Layer 1 | A1794512 | Yellow | Adhesive | None Detected |
| Misc1-02Layer 1A1794513YellowAdhesiveNone DetectedLayer 2A1794513WhiteLeveling CompoundNone DetectedMisc2-01A1794514Dark GreyCeramic Tile GroutNone DetectedMisc3-01A1794515Off-whiteCeramic Tile GroutNone DetectedDC1-01A1794516Brown, WhiteDoor CaulkingChrysotile 2%DC1-02A1794517Brown, WhiteDoor CaulkingChrysotile 2%DC2-01A1794518Off-whiteDoor CaulkingNone DetectedDC2-02A1794519Off-whiteDoor CaulkingNone DetectedWC1-01A1794520Dark BrownWindow CaulkingNone DetectedWC1-02A1794521Dark BrownWindow CaulkingNone DetectedWC2-01A1794523GrayWindow CaulkingNone DetectedWC2-02A1794523GrayWindow CaulkingNone DetectedWC2-02A1794525SilverRoof CementChrysotile 3%RC1-02A1794526White, Dark GreyRoof CementNone DetectedRC2-02A1794527White, Dark GreyRoof CementNone DetectedRC3-01A1794530BlackRoof CementNone DetectedRC3-01A1794529BlackRoof CementNone DetectedRC4-01A1794531Black, GrayRoof CementNone DetectedRC4-01A1794531Black, GrayRoof CementNone DetectedRC4-01A1794531Black, Gr | | Layer 2 | A1794512 | White | Leveling Compound | None Detected |
| Layer 2A1794513WhiteLeveling CompoundNone DetectedMisc2-01A1794514Dark GreyCeramic Tile GroutNone DetectedMisc3-01A1794515Off-whiteCeramic Tile ThinsetNone DetectedDC1-01A1794516Brown,WhiteDoor CaulkingChrysotile 2%DC1-02A1794517Brown,WhiteDoor CaulkingChrysotile 2%DC2-01A1794518Off-whiteDoor CaulkingNone DetectedDC2-02A1794519Off-whiteDoor CaulkingNone DetectedWC1-01A1794520Dark BrownWindow CaulkingNone DetectedWC1-02A1794521Dark BrownWindow CaulkingNone DetectedWC2-01A1794522GrayWindow CaulkingNone DetectedWC2-02A1794523GrayWindow CaulkingNone DetectedWC2-02A1794524SilverRoof CementChrysotile 3%RC1-01A1794526White,DarkRoof CementChrysotile 3%RC2-01A1794527White,DarkRoof CementNone DetectedGreyRC3-01A1794528BlackRoof CementNone DetectedRC3-01A1794531Black,GrayRoof CementNone DetectedRC4-01A1794532GrayRoof CementNone DetectedRC4-01A1794531Black,GrayRoof CementNone DetectedRC5-01A1794531Black,GrayRoof CementNone DetectedRC5-01A1794533GrayRoof Cement< | Misc1-02 | Layer 1 | A1794513 | Yellow | Adhesive | None Detected |
| Misc2-01A1794514Dark GreyCeramic Tile GroutNone DetectedMisc3-01A1794515Off-whiteCeramic Tile ThinsetNone DetectedDC1-01A1794516Brown, WhiteDoor CaulkingChrysotile 2%DC1-02A1794517Brown, WhiteDoor CaulkingChrysotile 2%DC2-01A1794518Off-whiteDoor CaulkingNone DetectedDC2-02A1794519Off-whiteDoor CaulkingNone DetectedWC1-01A1794520Dark BrownWindow CaulkingNone DetectedWC1-02A1794521Dark BrownWindow CaulkingNone DetectedWC2-01A1794522GrayWindow CaulkingNone DetectedWC2-02A1794523GrayWindow CaulkingNone DetectedWC2-02A1794525SilverRoof CementChrysotile 3%RC1-02A1794526SilverRoof CementOne DetectedRC2-01A1794527White, Dark GreyRoof CementNone DetectedRC3-01A1794529BlackRoof CementNone DetectedRC4-01A1794529BlackRoof CementNone DetectedRC4-01A1794530Black, GrayRoof CementNone DetectedRC4-02A1794531Black, GrayRoof CementNone DetectedRC5-01A1794532GrayRoof CementNone DetectedRC5-01A1794534Black, GrayRoof CementNone DetectedRC5-01A1794534Black, GrayRoof Cement | | Layer 2 | A1794513 | White | Leveling Compound | None Detected |
| Misc3-01A1794515Off-whiteCeramic Tile ThinsetNone DetectedDC1-01A1794516Brown,WhiteDoor CaulkingChrysotile 2%DC1-02A1794517Brown,WhiteDoor CaulkingChrysotile 2%DC2-01A1794518Off-whiteDoor CaulkingNone DetectedDC2-02A1794519Off-whiteDoor CaulkingNone DetectedWC1-01A1794520Dark BrownWindow CaulkingNone DetectedWC1-02A1794521Dark BrownWindow CaulkingNone DetectedWC2-01A1794522GrayWindow CaulkingNone DetectedWC2-02A1794523GrayWindow CaulkingNone DetectedWC2-02A1794523GrayWindow CaulkingNone DetectedRC1-01A1794526SilverRoof CementChrysotile 3%RC1-02A1794525SilverRoof CementNone DetectedRC2-01A1794526White,Dark GreyRoof CementNone DetectedRC3-01A1794529BlackRoof CementNone DetectedRC3-02A1794529BlackRoof CementNone DetectedRC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794532GrayRoof CementNone DetectedRC5-02A1794533GrayRoof CementNone DetectedRC5-01A1794534Black, Roof CementNone DetectedRC5 | Misc2-01 | | A1794514 | Dark Grey | Ceramic Tile Grout | None Detected |
| DC1-01A1794516Brown,WhiteDoor CaulkingChrysotile 2%DC1-02A1794517Brown,WhiteDoor CaulkingChrysotile 2%DC2-01A1794518Off-whiteDoor CaulkingNone DetectedDC2-02A1794519Off-whiteDoor CaulkingNone DetectedWC1-01A1794520Dark BrownWindow CaulkingNone DetectedWC1-02A1794521Dark BrownWindow CaulkingNone DetectedWC2-01A1794522GrayWindow CaulkingNone DetectedWC2-02A1794523GrayWindow CaulkingNone DetectedWC2-02A1794524SilverRoof CementChrysotile 3%RC1-02A1794525SilverRoof CementChrysotile 3%RC1-02A1794526White,Dark GreyRoof CementNone DetectedRC2-01A1794528BlackRoof CementNone DetectedRC3-01A1794529BlackRoof CementNone DetectedRC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794533GrayRoof CementNone DetectedRC5-02A1794534BlackRoof CementNone DetectedRC5-01A1794534BlackRoof CementNone DetectedRC5-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone DetectedRC5-01 <t< td=""><td>Misc3-01</td><td></td><td>A1794515</td><td>Off-white</td><td>Ceramic Tile Thinset</td><td>None Detected</td></t<> | Misc3-01 | | A1794515 | Off-white | Ceramic Tile Thinset | None Detected |
| DC1-02A1794517Brown,WhiteDoor CaulkingChrysotile 2%DC2-01A1794518Off-whiteDoor CaulkingNone DetectedDC2-02A1794519Off-whiteDoor CaulkingNone DetectedWC1-01A1794520Dark BrownWindow CaulkingNone DetectedWC1-02A1794521Dark BrownWindow CaulkingNone DetectedWC2-01A1794522GrayWindow CaulkingNone DetectedWC2-02A1794523GrayWindow CaulkingNone DetectedWC2-02A1794524SilverRoof CementChrysotile 3%RC1-01A1794525SilverRoof CementChrysotile 3%RC1-02A1794526White,Dark GreyRoof CementNone DetectedRC2-01A1794526White,Dark GreyRoof CementNone DetectedRC3-01A1794528BlackRoof CementNone DetectedRC3-02A1794529BlackRoof CementNone DetectedRC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC4-02A1794533GrayRoof CementNone DetectedRC5-01A1794534BlackRoof CementNone DetectedRC5-01A1794534BlackRoof CementNone DetectedRC5-01A1794534BlackRoof CementNone DetectedRC5-01A1794534BlackRoof CementNone DetectedRC5-01< | DC1-01 | | A1794516 | Brown,White | Door Caulking | Chrysotile 2% |
| DC2-01A1794518Off-whiteDoor CaulkingNone DetectedDC2-02A1794519Off-whiteDoor CaulkingNone DetectedWC1-01A1794520Dark BrownWindow CaulkingNone DetectedWC1-02A1794521Dark BrownWindow CaulkingNone DetectedWC2-01A1794522GrayWindow CaulkingNone DetectedWC2-02A1794523GrayWindow CaulkingNone DetectedWC2-02A1794523GrayWindow CaulkingNone DetectedRC1-01A1794524SilverRoof CementChrysotile 3%RC1-02A1794525SilverRoof CementChrysotile 3%RC2-01A1794526White,Dark GreyRoof CementNone DetectedRC2-02A1794527White,Dark GreyRoof CementNone DetectedRC3-01A1794528BlackRoof CementNone DetectedRC4-01A1794529Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794532GrayRoof CementNone DetectedRC5-02A1794533GrayRoof CementNone DetectedRC5-02A1794534BlackRoof CementNone DetectedRC5-01A1794534BlackRoof CementNone DetectedRC5-01A1794534BlackRoof CementNone DetectedRC5-01A1794534BlackRoof CementNone DetectedRC5-01 <t< td=""><td>DC1-02</td><td></td><td>A1794517</td><td>Brown,White</td><td>Door Caulking</td><td>Chrysotile 2%</td></t<> | DC1-02 | | A1794517 | Brown,White | Door Caulking | Chrysotile 2% |
| DC2-02A1794519Off-whiteDoor CaulkingNone DetectedWC1-01A1794520Dark BrownWindow CaulkingNone DetectedWC1-02A1794521Dark BrownWindow CaulkingNone DetectedWC2-01A1794522GrayWindow CaulkingNone DetectedWC2-02A1794523GrayWindow CaulkingNone DetectedWC2-02A1794524SilverRoof CementChrysotile 3%RC1-01A1794524SilverRoof CementChrysotile 3%RC1-02A1794526SilverRoof CementNone DetectedRC2-01A1794526White,Dark GreyRoof CementNone DetectedRC2-02A1794527White,Dark GreyRoof CementNone DetectedRC3-01A1794528BlackRoof CementNone DetectedRC4-01A1794529BlackRoof CementNone DetectedRC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794532GrayRoof CementNone DetectedRC5-02A1794533GrayRoof CementNone DetectedRC5-02A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof Cement PatchNone Detected | DC2-01 | | A1794518 | Off-white | Door Caulking | None Detected |
| WC1-01A1794520Dark BrownWindow CaulkingNone DetectedWC1-02A1794521Dark BrownWindow CaulkingNone DetectedWC2-01A1794522GrayWindow CaulkingNone DetectedWC2-02A1794523GrayWindow CaulkingNone DetectedWC1-01A1794524SilverRoof CementChrysotile 3%RC1-02A1794525SilverRoof CementChrysotile 3%RC2-01A1794526White,Dark GreyRoof CementNone DetectedRC2-02A1794527White,Dark GreyRoof CementNone DetectedRC3-01A1794528BlackRoof CementNone DetectedRC3-02A1794529BlackRoof CementNone DetectedRC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794533GrayRoof CementNone DetectedRC5-02A1794534BlackRoof CementNone DetectedRC5-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone DetectedRC6-01A1794534 <td>DC2-02</td> <td></td> <td>A1794519</td> <td>Off-white</td> <td>Door Caulking</td> <td>None Detected</td> | DC2-02 | | A1794519 | Off-white | Door Caulking | None Detected |
| WC1-02A1794521Dark BrownWindow CaulkingNone DetectedWC2-01A1794522GrayWindow CaulkingNone DetectedWC2-02A1794523GrayWindow CaulkingNone DetectedRC1-01A1794524SilverRoof CementChrysotile 3%RC1-02A1794525SilverRoof CementChrysotile 3%RC2-01A1794526White,Dark GreyRoof CementNone DetectedRC2-02A1794527White,Dark GreyRoof CementNone DetectedRC3-01A1794528BlackRoof CementNone DetectedRC3-02A1794529BlackRoof CementNone DetectedRC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794533GrayRoof CementNone DetectedRC5-02A1794534BlackRoof CementNone DetectedRC5-01A1794534BlackRoof CementNone DetectedRC5-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof Cement PatchNone Detected | WC1-01 | | A1794520 | Dark Brown | Window Caulking | None Detected |
| WC2-01A1794522GrayWindow CaulkingNone DetectedWC2-02A1794523GrayWindow CaulkingNone DetectedRC1-01A1794524SilverRoof CementChrysotile 3%RC1-02A1794525SilverRoof CementChrysotile 3%RC2-01A1794526White,Dark GreyRoof CementNone DetectedRC2-02A1794527White,Dark GreyRoof CementNone DetectedRC3-01A1794528BlackRoof CementNone DetectedRC3-02A1794529BlackRoof CementNone DetectedRC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794532GrayRoof CementNone DetectedRC5-02A1794533Black,GrayRoof CementNone DetectedRC5-02A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof Cement PatchNone Detected | WC1-02 | | A1794521 | Dark Brown | Window Caulking | None Detected |
| WC2-02A1794523GrayWindow CaulkingNone DetectedRC1-01A1794524SilverRoof CementChrysotile 3%RC1-02A1794525SilverRoof CementChrysotile 3%RC2-01A1794526White,Dark GreyRoof CementNone DetectedRC2-02A1794527White,Dark GreyRoof CementNone DetectedRC3-01A1794528BlackRoof CementNone DetectedRC3-02A1794529BlackRoof CementNone DetectedRC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794532GrayRoof CementNone DetectedRC5-02A1794533GrayRoof CementNone DetectedRC5-02A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone Detected | WC2-01 | | A1794522 | Gray | Window Caulking | None Detected |
| RC1-01A1794524SilverRoof CementChrysotile 3%RC1-02A1794525SilverRoof CementChrysotile 3%RC2-01A1794526White,Dark GreyRoof CementNone DetectedRC2-02A1794527White,Dark GreyRoof CementNone DetectedRC3-01A1794528BlackRoof CementNone DetectedRC3-02A1794529BlackRoof CementNone DetectedRC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794532GrayRoof CementNone DetectedRC5-02A1794533GrayRoof CementNone DetectedRC5-01A1794534BlackRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone Detected | WC2-02 | | A1794523 | Gray | Window Caulking | None Detected |
| RC1-02A1794525SilverRoof CementChrysotile 3%RC2-01A1794526White,Dark GreyRoof CementNone DetectedRC2-02A1794527White,Dark GreyRoof CementNone DetectedRC3-01A1794528BlackRoof CementNone DetectedRC3-02A1794529BlackRoof CementNone DetectedRC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794532GrayRoof CementNone DetectedRC5-02A1794533GrayRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone Detected | RC1-01 | | A1794524 | Silver | Roof Cement | Chrysotile 3% |
| RC2-01A1794526White,Dark GreyRoof CementNone DetectedRC2-02A1794527White,Dark GreyRoof CementNone DetectedRC3-01A1794528BlackRoof CementNone DetectedRC3-02A1794529BlackRoof CementNone DetectedRC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794532GrayRoof CementNone DetectedRC5-02A1794533GrayRoof CementNone DetectedRC6-01A1794534BlackRoof CementNone Detected | RC1-02 | | A1794525 | Silver | Roof Cement | Chrysotile 3% |
| RC2-02A1794527White,Dark GreyRoof CementNone DetectedRC3-01A1794528BlackRoof CementNone DetectedRC3-02A1794529BlackRoof CementNone DetectedRC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794532GrayRoof CementNone DetectedRC5-02A1794533GrayRoof CementNone DetectedRC6-01A1794534BlackRoof Cement PatchNone Detected | RC2-01 | | A1794526 | White,Dark Grey | Roof Cement | None Detected |
| RC3-01A1794528BlackRoof CementNone DetectedRC3-02A1794529BlackRoof CementNone DetectedRC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794532GrayRoof CementNone DetectedRC5-02A1794533GrayRoof CementNone DetectedRC6-01A1794534BlackRoof Cement PatchNone Detected | RC2-02 | | A1794527 | White,Dark Grey | Roof Cement | None Detected |
| RC3-02A1794529BlackRoof CementNone DetectedRC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794532GrayRoof CementNone DetectedRC5-02A1794533GrayRoof CementNone DetectedRC6-01A1794534BlackRoof Cement PatchNone Detected | RC3-01 | | A1794528 | Black | Roof Cement | None Detected |
| RC4-01A1794530Black,GrayRoof CementNone DetectedRC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794532GrayRoof CementNone DetectedRC5-02A1794533GrayRoof CementNone DetectedRC6-01A1794534BlackRoof Cement PatchNone Detected | RC3-02 | | A1794529 | Black | Roof Cement | None Detected |
| RC4-02A1794531Black,GrayRoof CementNone DetectedRC5-01A1794532GrayRoof CementNone DetectedRC5-02A1794533GrayRoof CementNone DetectedRC6-01A1794534BlackRoof Cement PatchNone Detected | RC4-01 | | A1794530 | Black,Gray | Roof Cement | None Detected |
| RC5-01 A1794532 Gray Roof Cement None Detected RC5-02 A1794533 Gray Roof Cement None Detected RC6-01 A1794534 Black Roof Cement Patch None Detected | RC4-02 | | A1794531 | Black,Gray | Roof Cement | None Detected |
| RC5-02 A1794533 Gray Roof Cement None Detected RC6-01 A1794534 Black Roof Cement Patch None Detected | RC5-01 | | A1794532 | Gray | Roof Cement | None Detected |
| RC6-01 A1794534 Black Roof Cement Patch None Detected | RC5-02 | | A1794533 | Gray | Roof Cement | None Detected |
| | RC6-01 | | A1794534 | Black | Roof Cement Patch | None Detected |

Page 2 of 3



Asbestos Report Summary By: POLARIZING LIGHT MICROSCOPY

PROJECT: 11-073

CEI LAB CODE: A14-11069

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

| Client ID | Layer | Lab ID | Color | Sample Description | ASBESTOS % |
|-----------|-------|----------|------------|--------------------|---------------|
| RC6-02 | | A1794535 | Black | Roof Cement Patch | None Detected |
| RC7-01 | | A1794536 | Black | Roof Cement | None Detected |
| RC7-02 | | A1794537 | Black | Roof Cement | None Detected |
| RS1-01 | | A1794538 | White | Roof Sealant | None Detected |
| RS1-02 | | A1794539 | White | Roof Sealant | None Detected |
| SS1-01 | | A1794540 | Tan,Black | Sealant | None Detected |
| SS1-02 | | A1794541 | Tan,Black | Sealant | None Detected |
| SS2-01 | | A1794542 | Gray,Black | Sealant | None Detected |
| SS2-02 | | A1794543 | Gray,Black | Sealant | None Detected |

Page 3 of 3



By: POLARIZING LIGHT MICROSCOPY

Client: ALG Environmental Consulting, LLC 20 Island Pond Road Derry, NH 03031 CEI Lab Code: A14-11069 Date Received: 08-11-14 Date Analyzed: 08-11-14 Date Reported: 08-12-14

Project: 11-073

ASBESTOS BULK PLM, EPA 600 METHOD

| Client ID | Lab | Lab | NO | N-ASBESTOS | ASBESTOS | | |
|---------------------------|----------------|--|---------|------------|------------------|------------------------------|---------------|
| Lab ID | Description | Attributes | Fibrous | | Non-I | Fibrous | % |
| SR1-01 A1794480 | Sheetrock | Heterogeneous Off-white Fibrous Loosely Bound | 15% | Cellulose | 80% 5% | Gypsum Paint | None Detected |
| SR1-02 A1794481 | Sheetrock | Heterogeneous Off-white Fibrous Loosely Bound | 15% | Cellulose | 80% 5% | Gypsum Paint | None Detected |
| SR1-03 A1794482 | Sheetrock | Heterogeneous Off-white Fibrous Loosely Bound | 15% | Cellulose | 80% 5% | Gypsum Paint | None Detected |
| SR1-04 A1794483 | Sheetrock | Heterogeneous Off-white Fibrous Loosely Bound | 15% | Cellulose | 80% 5% | Gypsum Paint | None Detected |
| SR1-05 A1794484 | Sheetrock | Heterogeneous Off-white Fibrous Loosely Bound | 15% | Cellulose | 80% 5% | Gypsum Paint | None Detected |
| JC1-01 A1794485 | Joint Compound | Heterogeneous White Non-fibrous Loosely Bound | | | 70% 25% 5% | Calc Carb Binder Paint | None Detected |
| JC1-02 A1794486 | Joint Compound | Heterogeneous White Non-fibrous Loosely Bound | | | 70% 25% 5% | Calc Carb Binder Paint | None Detected |



By: POLARIZING LIGHT MICROSCOPY

Client: ALG Environmental Consulting, LLC 20 Island Pond Road Derry, NH 03031 CEI Lab Code: A14-11069 Date Received: 08-11-14 Date Analyzed: 08-11-14 Date Reported: 08-12-14

Project: 11-073

ASBESTOS BULK PLM, EPA 600 METHOD

| Client ID | Lab | Lab | NO | N-ASBESTOS | COMPO | NENTS | ASBESTOS |
|---------------------------|----------------|--|------|------------|------------------|------------------------------|---------------|
| Lab ID | Description | Attributes | Fibr | ous | Non-I | Fibrous | % |
| SR1-01 A1794480 | Sheetrock | Heterogeneous Off-white Fibrous Loosely Bound | 15% | Cellulose | 80% 5% | Gypsum Paint | None Detected |
| SR1-02 A1794481 | Sheetrock | Heterogeneous Off-white Fibrous Loosely Bound | 15% | Cellulose | 80% 5% | Gypsum Paint | None Detected |
| SR1-03 A1794482 | Sheetrock | Heterogeneous Off-white Fibrous Loosely Bound | 15% | Cellulose | 80% 5% | Gypsum Paint | None Detected |
| SR1-04 A1794483 | Sheetrock | Heterogeneous Off-white Fibrous Loosely Bound | 15% | Cellulose | 80% 5% | Gypsum Paint | None Detected |
| SR1-05 A1794484 | Sheetrock | Heterogeneous Off-white Fibrous Loosely Bound | 15% | Cellulose | 80% 5% | Gypsum Paint | None Detected |
| JC1-01 A1794485 | Joint Compound | Heterogeneous White Non-fibrous Loosely Bound | | | 70% 25% 5% | Calc Carb Binder Paint | None Detected |
| JC1-02 A1794486 | Joint Compound | Heterogeneous White Non-fibrous Loosely Bound | | | 70% 25% 5% | Calc Carb Binder Paint | None Detected |

Page 1 of 11



By: POLARIZING LIGHT MICROSCOPY

Client: ALG Environmental Consulting, LLC 20 Island Pond Road Derry, NH 03031
 CEI Lab Code:
 A14-11069

 Date Received:
 08-11-14

 Date Analyzed:
 08-11-14

 Date Reported:
 08-12-14

Project: 11-073

ASBESTOS BULK PLM, EPA 600 METHOD

| Client ID Lab ID | Lab Description | Lab Attributes | NON-ASBEST Fibrous | OS COMPOI Non-F | NENTS librous | ASBESTOS % None Detected |
|-------------------------------|--------------------|--|-----------------------|--------------------|------------------------------|--------------------------------|
| JC1-03 Joint Comp A1794487 | Joint Compound | Heterogeneous White Non-fibrous Loosely Bound | | 70% 25% 5% | Calc Carb Binder Paint | |
| JC1-04 A1794488 | Joint Compound | Heterogeneous White Non-fibrous Loosely Bound | | 70% 25% 5% | Calc Carb Binder Paint | None Detected |
| JC1-05 A1794489 | Joint Compound | Heterogeneous White Non-fibrous Loosely Bound | | 70% 25% 5% | Calc Carb Binder Paint | None Detected |
| FT1-01 A1794490 | Floor Tile | Homogeneous White Non-fibrous Tightly Bound | | 100% | Vinyl | None Detected |
| FT1-02 A1794491 | Floor Tile | Homogeneous White Non-fibrous Tightly Bound | | 100% | Vinyl | None Detected |
| FT1A-01 A1794492 | Mastic | Homogeneous Tan Non-fibrous Tightly Bound | | 100% | Mastic | None Detected |
| FT1A-02 A1794493 | Mastic | Homogeneous Tan Non-fibrous Tightly Bound | | 100% | Mastic | None Detected |

Page 2 of 11



By: POLARIZING LIGHT MICROSCOPY

Client: ALG Environmental Consulting, LLC 20 Island Pond Road Derry, NH 03031 CEI Lab Code: A14-11069 Date Received: 08-11-14 Date Analyzed: 08-11-14 Date Reported: 08-12-14

Project: 11-073

ASBESTOS BULK PLM, EPA 600 METHOD

| Client ID Lab ID | ID Lab Lab D Description Attributes | | NON-ASBESTOS COMPONENTS Fibrous Non-Fibrous | | | ASBESTOS % |
|----------------------------------|--|--|--|------------------|------------------------------|---------------|
| JC1-03 Joint Compour A1794487 | Joint Compound | Heterogeneous White Non-fibrous Loosely Bound | | 70% 25% 5% | Calc Carb Binder Paint | None Detected |
| JC1-04 A1794488 | Joint Compound | Heterogeneous White Non-fibrous Loosely Bound | | 70% 25% 5% | Calc Carb Binder Paint | None Detected |
| JC1-05 A1794489 | Joint Compound | Heterogeneous White Non-fibrous Loosely Bound | | 70% 25% 5% | Calc Carb Binder Paint | None Detected |
| FT1-01 A1794490 | Floor Tile | Homogeneous White Non-fibrous Tightly Bound | | 100% | Vinyl | None Detected |
| FT1-02 A1794491 | Floor Tile | Homogeneous White Non-fibrous Tightly Bound | | 100% | Vinyl | None Detected |
| FT1A-01 A1794492 | Mastic | Homogeneous Tan Non-fibrous Tightly Bound | | 100% | Mastic | None Detected |
| FT1A-02 A1794493 | Mastic | Homogeneous Tan Non-fibrous Tightly Bound | | 100% | Mastic | None Detected |

Page 2 of 11



By: POLARIZING LIGHT MICROSCOPY

Client: ALG Environmental Consulting, LLC 20 Island Pond Road Derry, NH 03031
 CEI Lab Code:
 A14-11069

 Date Received:
 08-11-14

 Date Analyzed:
 08-11-14

 Date Reported:
 08-12-14

Project: 11-073

ASBESTOS BULK PLM, EPA 600 METHOD

| Client ID Lab ID | Lab Description | Lab Attributes | NON-ASBES | TOS COMPOI | ASBESTOS | |
|---------------------------|--------------------|--|-----------|------------|----------|---------------|
| FT2-01 A1794494 | Floor Tile | Homogeneous Beige Non-fibrous Tightly Bound | | 100% | Vinyl | None Detected |
| FT2-02 A1794495 | Floor Tile | Homogeneous Beige Non-fibrous Tightly Bound | | 100% | Vinyl | None Detected |
| FT2A-01 A1794496 | Mastic | Homogeneous Tan Non-fibrous Tightly Bound | | 100% | Mastic | None Detected |
| FT2A-02 A1794497 | Mastic | Homogeneous Tan Non-fibrous Tightly Bound | | 100% | Mastic | None Detected |
| FT3-01 A1794498 | Floor Tile | Homogeneous White Non-fibrous Tightly Bound | | 100% | Vinyl | None Detected |
| FT3-02 A1794499 | Floor Tile | Homogeneous White Non-fibrous Tightly Bound | | 100% | Vinyl | None Detected |
| FT3A-01 A1794500 | Mastic | Homogeneous Tan Non-fibrous Tightly Bound | | 100% | Mastic | None Detected |

Page 3 of 11



By: POLARIZING LIGHT MICROSCOPY

Client: ALG Environmental Consulting, LLC 20 Island Pond Road Derry, NH 03031
 CEI Lab Code:
 A14-11069

 Date Received:
 08-11-14

 Date Analyzed:
 08-11-14

 Date Reported:
 08-12-14

Project: 11-073

ASBESTOS BULK PLM, EPA 600 METHOD

| Client ID Lab ID | Lab Description | Lab Attributes | NON-ASBEST Fibrous | OS COMPOR Non-F | NENTS ibrous | ASBESTOS % | |
|----------------------------|--------------------|---|-----------------------|--------------------|-----------------|---------------|--|
| FT3A-02 A1794501 | Mastic | Homogeneous Tan Non-fibrous Tightly Bound | | 100% | Mastic | None Detected | |
| FT4-01 A1794502A | Floor Tile | Homogeneous Brown Non-fibrous Tightly Bound | | 100% | Vinyl | None Detected | |
| A1794502B | Mastic | Homogeneous Tan Non-fibrous Tightly Bound | | 100% | Mastic | None Detected | |
| FT4-02 A1794503A | Floor Tile | Homogeneous Brown Non-fibrous Tightly Bound | | 100% | Vinyl | None Detected | |
| A1794503B | Mastic | Homogeneous Tan Non-fibrous Tightly Bound | | 100% | Mastic | None Detected | |
| FT5-01 A1794504A | Floor Tile | Homogeneous Gray Non-fibrous Tightly Bound | | 100% | Vinyl | None Detected | |
| A1794504B | Mastic | Homogeneous Yellow Non-fibrous Tightly Bound | | 100% | Mastic | None Detected | |

Page 4 of 11



By: POLARIZING LIGHT MICROSCOPY

Client: ALG Environmental Consulting, LLC 20 Island Pond Road Derry, NH 03031
 CEI Lab Code:
 A14-11069

 Date Received:
 08-11-14

 Date Analyzed:
 08-11-14

 Date Reported:
 08-12-14

Project: 11-073

ASBESTOS BULK PLM, EPA 600 METHOD

| Client ID Lab ID | Lab Description | Lab Attributes | NO Fibr | N-ASBESTOS C ous | OMPOI Non-F | NENTS ibrous | ASBESTOS % |
|---------------------|--------------------|---|------------|-------------------------|----------------|------------------|---------------|
| FT5-02 A1794505A | Floor Tile | Homogeneous Gray Non-fibrous Tightly Bound | | | 100% | Vinyl | None Detected |
| A1794505B | Mastic | Homogeneous Yellow Non-fibrous Tightly Bound | | | 100% | Mastic | None Detected |
| CT1-01 A1794506 | Celling Tile | Heterogeneous White Fibrous Loosely Bound | 65% 15% | Cellulose Fiberglass | 15% 5% | Perlite Paint | None Detected |
| CT1-02 A1794507 | Celling Tile | Heterogeneous White Fibrous Loosely Bound | 65% 15% | Cellulose Fiberglass | 15% 5% | Perlite Paint | None Detected |
| CA1-01 A1794508 | Carpet Adhesive | Heterogeneous Yellow Fibrous Bound | <1% | Synthetic Fiber | 100% | Mastic | None Detected |
| CA1-02 A1794509 | Carpet Adhesive | Heterogeneous Yellow Fibrous Bound | <1% | Synthetic Fiber | 100% | Mastic | None Detected |
| CBA1-01 A1794510 | Covebase Adhesive | Homogeneous Yellow Non-fibrous Bound | | | 100% | Mastic | None Detected |

Page 5 of 11



By: POLARIZING LIGHT MICROSCOPY

Client: ALG Environmental Consulting, LLC 20 Island Pond Road Derry, NH 03031
 CEI Lab Code:
 A14-11069

 Date Received:
 08-11-14

 Date Analyzed:
 08-11-14

 Date Reported:
 08-12-14

Project: 11-073

ASBESTOS BULK PLM, EPA 600 METHOD

| Client ID | Lab | Lab NON-ASBESTOS COMPONENTS | | | | NENTS | ASBESTOS | |
|---------------------------------|----------------------|--|---------|-----------|------------------|----------------------------------|---------------|--|
| Lab ID | Description | Attributes | Fibrous | | Non-Fibrous | | % | |
| CBA1-02 A1794511 | Covebase Adhesive | Homogeneous Yellow Non-fibrous Bound | | | 100% | Mastic | None Detected | |
| Misc1-01 Layer 1 A1794512 | Adhesive | Homogeneous Yellow Non-fibrous Bound | | | 100% | Mastic | None Detected | |
| Layer 2 A1794512 | Leveling Compound | Homogeneous White Non-fibrous Bound | | | 75% 20% 5% | Binder Calc Carb Silicates | None Detected | |
| Misc1-02 Layer 1 A1794513 | Adhesive | Homogeneous Yellow Non-fibrous Bound | | | 100% | Mastic | None Detected | |
| Layer 2 A1794513 | Leveling Compound | Homogeneous White Non-fibrous Bound | | | 75% 20% 5% | Binder Calc Carb Silicates | None Detected | |
| Misc2-01 A1794514 | Ceramic Tile Grout | Heterogeneous Dark Grey Non-fibrous Bound | 5% | Cellulose | 70% 25% | Silicates Binder | None Detected | |
| Misc3-01 A1794515 | Ceramic Tile Thinset | Homogeneous Off-white Non-fibrous Bound | | | 75% 25% | Silicates Binder | None Detected | |



By: POLARIZING LIGHT MICROSCOPY

Client: ALG Environmental Consulting, LLC 20 Island Pond Road Derry, NH 03031 CEI Lab Code: A14-11069 Date Received: 08-11-14 Date Analyzed: 08-11-14 Date Reported: 08-12-14

Project: 11-073

ASBESTOS BULK PLM, EPA 600 METHOD

| Client ID Lab | | Lab NON-ASBESTOS CO | | | NENTS | ASBESTOS | |
|---------------|-----------------|---------------------|---------|-------|-----------|--------------------|--|
| Lab ID | Description | Attributes | Fibrous | Non-F | ibrous | % 2% Chrysotile | |
| DC1-01 | Door Caulking | Heterogeneous | | 63% | Binder | | |
| A1794516 | | Brown,White | | 25% | Calc Carb | | |
| | | Non-fibrous | | 10% | Paint | | |
| | | Bound | | | | | |
| DC1-02 | Door Caulking | Heterogeneous | | 63% | Binder | 2% Chrysotile | |
| A1794517 | | Brown,White | | 25% | Calc Carb | | |
| | | Non-fibrous | | 10% | Paint | | |
| | | Bound | | | | | |
| DC2-01 | Door Caulking | Heterogeneous | | 100% | Caulk | None Detected | |
| A1794518 | | Off-white | | | | | |
| | | Non-fibrous | | | | | |
| | | Tightly Bound | | | | | |
| DC2-02 | Door Caulking | Heterogeneous | | 100% | Caulk | None Detected | |
| A1794519 | | Off-white | | | | | |
| | | Non-fibrous | | | | | |
| | | Tightly Bound | | | | | |
| WC1-01 | Window Caulking | Heterogeneous | | 100% | Binder | None Detected | |
| A1794520 | | Dark Brown | | <1% | Foam | | |
| | | Non-fibrous | | | | | |
| | | Tightly Bound | | | | | |
| WC1-02 | Window Caulking | Heterogeneous | | 100% | Binder | None Detected | |
| A1794521 | | Dark Brown | | <1% | Foam | | |
| | | Non-fibrous | | | | | |
| | | Tightly Bound | | | | | |
| WC2-01 | Window Caulking | Heterogeneous | | 100% | Binder | None Detected | |
| A1794522 | | Gray | | | | | |
| | | Non-fibrous | | | | | |
| | | Tightly Bound | | | | | |

Page 7 of 11



By: POLARIZING LIGHT MICROSCOPY

Client: ALG Environmental Consulting, LLC 20 Island Pond Road Derry, NH 03031
 CEI Lab Code:
 A14-11069

 Date Received:
 08-11-14

 Date Analyzed:
 08-11-14

 Date Reported:
 08-12-14

Project: 11-073

ASBESTOS BULK PLM, EPA 600 METHOD

| Client ID Lab ID | Lab Description | Lab Attributes | Lab NON-ASBES Attributes Fibrous | | NENTS | ASBESTOS % |
|---------------------|--------------------|--|-------------------------------------|------------|-----------------|---------------|
| WC2-02 A1794523 | Window Caulking | Heterogeneous Gray Non-fibrous Tightly Bound | | 100% | Binder | None Detected |
| RC1-01 A1794524 | Roof Cement | Homogeneous Silver Non-fibrous Tightly Bound | | 72% 25% | Binder Paint | 3% Chrysotile |
| RC1-02 A1794525 | Roof Cement | Homogeneous Silver Non-fibrous Tightly Bound | | 72% 25% | Binder Paint | 3% Chrysotile |
| RC2-01 A1794526 | Roof Cement | Heterogeneous White,Dark Grey Non-fibrous Tightly Bound | | 100% | Binder | None Detected |
| RC2-02 A1794527 | Roof Cement | Heterogeneous White,Dark Grey Non-fibrous Tightly Bound | | 100% | Binder | None Detected |
| RC3-01 A1794528 | Roof Cement | Homogeneous Black Non-fibrous Tightly Bound | | 100% | Binder | None Detected |
| RC3-02 A1794529 | Roof Cement | Homogeneous Black Non-fibrous Tightly Bound | | 100% | Binder | None Detected |

Page 8 of 11



By: POLARIZING LIGHT MICROSCOPY

Client: ALG Environmental Consulting, LLC 20 Island Pond Road Derry, NH 03031
 CEI Lab Code:
 A14-11069

 Date Received:
 08-11-14

 Date Analyzed:
 08-11-14

 Date Reported:
 08-12-14

Project: 11-073

ASBESTOS BULK PLM, EPA 600 METHOD

| Client ID | Lab | Lab | NO | NON-ASBESTOS COMPONENTS | | | ASBESTOS | |
|--------------------|-------------------|---|---------|-------------------------|-------------|--------|---------------|--|
| Lab ID | Description | Attributes Heterogeneous Black,Gray Non-fibrous Tightly Bound | Fibrous | | Non-Fibrous | | % | |
| RC4-01 A1794530 | Roof Cement | | | | 100% | Binder | None Detected | |
| RC4-02 A1794531 | Roof Cement | Heterogeneous Black,Gray Non-fibrous Tightly Bound | | | 100% | Binder | None Detected | |
| RC5-01 A1794532 | Roof Cement | Heterogeneous Gray Non-fibrous Tightly Bound | | | 100% | Binder | None Detected | |
| RC5-02 A1794533 | Roof Cement | Heterogeneous Gray Non-fibrous Tightly Bound | | | 100% | Binder | None Detected | |
| RC6-01 A1794534 | Roof Cement Patch | Homogeneous Black Fibrous Tightly Bound | 10% | Cellulose | 90% | Binder | None Detected | |
| RC6-02 A1794535 | Roof Cement Patch | Homogeneous Black Fibrous Tightly Bound | 10% | Cellulose | 90% | Binder | None Detected | |
| RC7-01 A1794536 | Roof Cement | Homogeneous Black Fibrous Tightly Bound | 10% | Cellulose | 90% | Tar | None Detected | |

Page 9 of 11



By: POLARIZING LIGHT MICROSCOPY

Client: ALG Environmental Consulting, LLC 20 Island Pond Road Derry, NH 03031 CEI Lab Code: A14-11069 Date Received: 08-11-14 Date Analyzed: 08-11-14 Date Reported: 08-12-14

Project: 11-073

ASBESTOS BULK PLM, EPA 600 METHOD

| Client ID Lab ID | Lab Description | Lab Attributes | NON-ASBESTOS (Fibrous | | COMPONENTS Non-Fibrous | | ASBESTOS % |
|---------------------------|--------------------|---|---------------------------|-----------|---------------------------|--------|---------------|
| RC7-02 A1794537 | Roof Cement | Homogeneous Black Fibrous Tightly Bound | 10% | Cellulose | 90% | Tar | None Detected |
| RS1-01 A1794538 | Roof Sealant | Homogeneous White Fibrous Tightly Bound | 5% | Cellulose | 95% | Binder | None Detected |
| RS1-02 A1794539 | Roof Sealant | Homogeneous White Fibrous Tightly Bound | 5% | Cellulose | 95% | Binder | None Detected |
| SS1-01 A1794540 | Sealant | Heterogeneous Tan,Black Non-fibrous Tightly Bound | | | 100% | Binder | None Detected |
| SS1-02 A1794541 | Sealant | Heterogeneous Tan,Black Non-fibrous Tightly Bound | 3 | | 100% | Binder | None Detected |
| SS2-01 A1794542 | Sealant | Heterogeneous Gray,Black Non-fibrous Tightly Bound | | | 100% | Binder | None Detected |
| SS2-02 A1794543 | Sealant | Heterogeneous Gray,Black Non-fibrous Tightly Bound | | | 100% | Binder | None Detected |

Page 10 of 11



| METHOD: | EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020 | |
|---------|---|--|
| | Calc Carb = Calcium Carbonate | |
| | Non-Trem = Non-Asbestiform Tremolite | |
| LEGEND: | Non-Anth = Non-Asbestiform Anthophylite | |

The detection limit for the method is <1% by visual estimation and 0.25% by 400 point counts or 0.1% by 1,000 point counts.

Due to the limitations of the EPA 600 Method, nonfriable organically bound materials (NOBs) such as vinyl floor tiles can be difficult to analyze via polarizing light microscopy (PLM). EPA recommends that all NOBs analyzed by PLM, and found not to contain asbestos, be further analyzed by Transmission Electron Microscopy (TEM). Please note that PLM analysis of dust and soil samples for asbestos is not covered under NVLAP accreditation.

CEI Labs, Inc. can perform positive stop analysis if requested by customer. However, it is the responsibility of the customer to determine if the samples grouped together are in fact the same type of material and belong to the same homogeneous area.

This report may not be reproduced, except in full, without written approval by CEI LABS. CEI LABS makes no warranty representation regarding the accuracy of client submitted information in preparing and presenting analytical results. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. Government.

ANALYST: from frall

APPROVED BY: // Com Sas /

Tianbao Bai, Ph.D. Laboratory Director



CEI Labs, 107 New Edition Court, Cary, NC 27511, Phone: (866) 481-1412

Page 11 of 11



CHAIN OF CUSTODY

107 New Edition Court, Cary, NC 27511 Tel: 866-481-1412; Fax: 919-481-1442 CEILab Code: AIG- 11069 G4 CEILab Code: AIG- 11069 G4 CEILab ID, Range: A 1799480 AIR 459

| COMPANY CONTACT INFORMATION | |
|------------------------------|--|
| Company: ALG Environmental | Client #: |
| Address: 20 Island Pond Road | Job Contact: Allen Grinnell, Stephen Powell |
| Derry NH 03038 | Email: agrinoull @ algenvion, powellman 10gnarling |
| | Tel: 603-216-1350 |
| Project Name: | Fax: 603-216-1351 |
| Project ID #: //- 073 | P.O. #: |

| and the second second second | A Second Second | States and | - Sector | TURNARC | UND TIME | and the | Carl Charles |
|------------------------------|-----------------|------------------------|---|--|----------|---------|--------------|
| ASBESTOS | METHOD | 24 HR* | 8 HR | 24 HR | 2 DAY | - 3 DAY | SDAY |
| PLM BULK | EPA 600 | | | | | | |
| PLM POINT COUNT (400) | EPA 600 | | | | | | |
| PLM POINT COUNT (1000) | EPA 600 | | | | | | |
| PLM GRAVIMETRIC | EPA 600 | STATISTICS STATISTICS | | | | | |
| PLM GRAV w POINT COUNT | EPA 600 | and and a group of the | | | | | |
| PCM AIR | NIOSH 7400 | | | | | | |
| TEM AIR | AHERA | | | | | | |
| TEM AIR | NIOSH 7402 | | | | | | |
| TEM BULK | CHATFIELD | | | | | | |
| TEM DUST WIPE | ASTM D6480-05 | | | | | | |
| TEM DUST MICROVAC | ASTM D5755-09 | | | | | | |
| TEM QUALITATIVE | CEI LABS | | | | | | |
| OTHER: | | | | | | | |
| LEAD PAINT | METHOD | 4.HB* | 6 HR** | 24.HR** | 2 DAY | 3 DAY | 5 DAY |
| LEAD PAINT | EPA SW846 7000B | | | | | | |
| LEAD WIPE | EPA SW846 7000B | | | | | | |
| LEAD SOIL | EPA SW846 7000B | | an sing sing sing sing sing sing sing sin | Service and the service of the servi | | | |
| LEAD AIR | NIOSH 7082 | | H AN | | | | |
| OTHER: | | | 13月1日 | | | \Box | |

| REMARKS: | | | | I | Accept Samples |
|--------------|---------------------------|--------------------------|--|---|----------------|
| | | sever 744 ar and 2016 of | 20100000000000000000000000000000000000 | | Reject Samples |
| Relieduished | 3y. Cate.Tim 8-8-14 /2 | JEX 1X | Received | | RIU SIV |
| 11 | | | 3 | | |

*Call to confirm RUSH analysis.

Samples will be disposed of 30 days after analysis

**TAT's are not available. Lead samples are subcontracted for analysis to an ELLAP accredited lab.

VERSION CCOC.0713.1/2.LD Customer COC Page 1

Hazardous Building Materials Survey 2 Coppage Drive-Worcester Massachusetts ALG Job # 14-073 30 of 42



CONTRACTOR

A14-11069

ø

SAMPLING FORM

| Company: AIG Environmental | | Job Contact: Allen Grissell Grade B | | | | |
|----------------------------|----------------------------------|-------------------------------------|--|--|--|--|
| Project Name: | | in and arranger, stepten Powell | | | | |
| Project ID #: ### 14.073 | | Tel: 603-216-1350 | | | | |
| | | | | | | |
| SAMPLE.ID# | DESCRIPTION / LOCATION | L VOLUME: | | | | |
| SR 1.01 | Steet Roch | ARCANE AND COMMENTS | | | | |
| SR1-02 | " | | | | | |
| SR1-03 | * | | | | | |
| SR1-04 | " | | | | | |
| SR1-05 | " | | | | | |
| 501.01 | Joint Compound | | | | | |
| 361.02 | 1. | | | | | |
| JC1 - 03 | " | | | | | |
| Jc1-04 | " | | | | | |
| JC1-05 | 1 | | | | | |
| FT1-01 | 12 x 12 white floor Tile | | | | | |
| FT1-02 | 11 11 | | | | | |
| FTIA.01 | Tan Mastic | | | | | |
| FTIA.01 | " | | | | | |
| FT2-01 | 12x12 Beine Floor Tite | | | | | |
| FT2-02 | 11 11 | | | | | |
| FT2A.01 | Tan Mastic | | | | | |
| FT2A-02 | 11 | | | | | |
| FT3-01 | 12x12 White Tile water Carpet | 1 | | | | |
| FT3-02 | 11 | | | | | |
| FT 3A.01 | Tan Mastic | | | | | |
| FT34.02 | " | | | | | |
| FT4-01 | 12×12 Brown Flow Till | | | | | |
| FT4-02 | | | | | | |
| 1= 75-01 | 12x12 Gray Floor Tily | | | | | |
| F 75-02 | 11 " | | | | | |
| CT1.01 | 2x4 Fissue + Pin Hole Certine Ti | le | | | | |
| CT/ . 02 | 11 11 | | | | | |
| CA1-01 | Carpet Adlesive | | | | | |
| CA1.02 | " | | | | | |

1 of 3. Page_

VERSION CCOC.0713.2/2.LD Customer COC Page 2

A14-11069



SAMPLING FORM

| COMPANY C | ONTACTINEORMATION | |
|---------------|-------------------|----------------------------------|
| Company: AI | 6 Environmental | Job Contact: Alles German Stands |
| Project Name: | | , sight towell |
| Project ID #: | 14-073 | Tel: 603-216-1350 |

| | | Charles and the | |
|-------------|---|--------------------|--|
| SAMPLE ID# | DESCRIPTION /LOCATION | VCLUME | |
| CBA 1.01 | Cove Base Addesive | A H S CALLER AND A | COMMENTS: |
| C BA 1 - 02 | " | | (4 |
| Miscl-01 | white Floor levelastic | | |
| Misc1-02 | <i>it 11</i> | | |
| Misc 2.01 | Ceremic Tile Grout | | |
| Misc 3.01 | ceramic Tile Thin Set | | |
| Dc 1.01 | Door Caulking | | |
| DC 1 - 02 | " | | |
| DC2-01 | Door Caulking | | |
| DC 2.02 | 1 | | |
| WC1.01 | Window Caulking | | |
| WC1-02 | 11 11 | | |
| WC 2.01 | Window Caulking | | |
| WC 2.02 | 11 11 | | |
| RC1-01 | Roof Comint at Parapot Base | | and the second sec |
| RC1-02 | 11 11 | | |
| RC2.01 | Roof Cenner on Metal Paral Secons | | |
| RC2.02 | 11 11 | | |
| RC 3-01 | Roof Centrat on Square Blower Resetvation | | |
| RC 3-02 | // // // | | |
| RC4-01 | Roof Centrat on Stink Pipes Black | | |
| RC4.07 | 11 11 11 | | |
| Re5.01 | Root Cement on stink lips Gray | | - |
| RC5.02 | " " " | | |
| RCG . OI | Root Cement Patch | | |
| RC6-07 | 1) // | | |
| RC7-01 | Root Cement on Duct Insulation | | |
| R(7.07 | 1) 1/ | | |
| RS1-01 | white Root Sealant | | |
| RSI-OL | • • • | | |

Page 2 of 3

VERSION CCOC.0713.2/2.LD Customer COC Page 2

ALG

A14-11069



SAMPLING FORM

| COMPANY C | ONTACTINFORMATION | |
|---------------|-------------------|---|
| Company: Al | & Environmental | Job Contact Alles Generall Secola P. 11 |
| Project Name: | | and and and and and a source of the |
| Project ID #: | 14.073 | Tel: 603-216-1350 |

| SAMPLE ID# | DESCRIPTION / LOCATION |
|------------|------------------------------------|
| 551-01 | Scalant on Proper Cap Scams |
| 551.02 | |
| 552-01 | Scalant on start parapet Cap scale |
| 552-02 | 11 11 11 11 |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

Page 3 of 3

VERSION CCOC.0713.2/2.LD Customer COC Page 2

Hazardous Building Materials Survey 2 Coppage Drive-Worcester Massachusetts ALG Job # 14-073

5.2 Appendix C: Inspector Qualifications

| Children Potente | mination for 5 U.S.C. 2646 | Windery P. Training Director |
|---|---|--|
| This is to certify that Stephen Powell | quisite training, and has passed an exar reaccreditation as: Oestos Inspector Refresher of the Toxic Substance Control Act, 15 | Course Location Institute for Environmental Education, Inc. 16 Upton Drive Willington, MA 01887 Abril 25, 2015 Examination Date Examination Date Experience Date |
| EDUCATION | has completed the re ASb pursuant to Title II o | April 25, 2014 Course Dates 14-8959-106-224343 Certificate Number 16 Ubror Brive, Winning |



5.3 Appendix D: Laboratory Certifications



38 of 42



Certificate No: A042574



THE COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT

DEPARTMENT OF LABOR STANDARDS 19 Staniford Street, Boston, Massachusetts 02114

CERTIFICATION FOR ASBESTOS ANALYTICAL SERVICES

CEI LABS, INC. 107 NEW EDITION COURT CARY NC 27511

LICENSE: AA000168

EXPIRES: Friday, October 10, 2014

IN ACCORDANCE WITH MGL CH. 149 § 6B AND 453 CMR 6.08 THIS CERTIFICATE IS ISSUED BY THE DEPARTMENT OF LABOR STANDARDS TO THE ABOVE NAMED ENTITIY TO PROVIDE THE ASBESTOS ANALYTICAL SERVICES SPECIFICALLY LISTED BELOW.

> CLASS A CERTIFICATE CLASS D CERTIFICATE

sputter a un

HEATHER E. ROWE, DIRECTOR

Mailing Address:

CEI LABS, INC. 107 NEW EDITION COURT CARY, NC 27511

Hazardous Building Materials Survey 2 Coppage Drive-Worcester Massachusetts ALG Job # 14-073



National Voluntary Laboratory Accreditation Program



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

CEI Labs, Inc. 107 New Edition Court Cary, NC 27511 Dr. Tianbao Bai Phone: 919-481-1413 Fax: 919-481-1442 E-Mail: bai@ceilabs.com URL: http://www.ceilabs.com

BULK ASBESTOS FIBER ANALYSIS (PLM)

NVLAP LAB CODE 101768-0

 NVLAP Code
 Designation / Description

 18/A01
 EPA 600/M4-82-020: Interim Method for the Determination of Asbestos in Bulk Insulation Samples

 18/A03
 EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

2013-04-01 through 2014-03-31

Effective dates

Page 1 of 1

For the National Institute of Standards and Technology NVLAP-01S (REV: 2005-05-19)



RESIDENT ENGINEERING ▼ GEOTECHNICAL ▼ ENVIRONMENTAL ▼ TESTING

GEOTECHNICAL SUMMARY REPORT

EMERGENCY SAFETY BUILDING 2 COPPAGE DRIVE WORCESTER, NEW HAMPSHIRE

Prepared For:

City of Worcester Department of Public Works 20 East Worcester Street Worcester, MA 01604

Prepared By:

John Turner Consulting, Inc. 19 Dover Street Dover, New Hampshire 03820

JTC Project No.: 14-15-067

November 20, 2014

DOVER, NH I WORCESTER, MA I WESTFIELD, MA I PORTLAND, ME I WEST HARTFORD, VT I JOHNSTON, RI

TABLE OF CONTENTS

Geotechnical Summary Report

Test Boring Location Plan & Test Boring Logs

Geotechnical Laboratory Testing Reports

Supplemental Data

Geotechnical Summary Report



GEOTECHNICAL SUMMARY REPORT

Prepared by:

JOHN TURNER CONSULTING, INC.

19 DOVER STREET DOVER, NEW HAMPSHIRE P. 603-749-1841/F. 603-516-6851 consultJTC.com

TO: City of Worcester Department of Public Works 20 East Worcester Street Worcester, MA 01604



- FROM:Judson Zachar, P.E.Kevin Martin, P.E.Staff EngineerGeotechnical Engineer
- DATE: October 14, 2014 Edited: November 20, 2014
- RE: GEOTECHNICAL SUMMARY REPORT EMERGENCY SAFETY BUILDING 2 COPPAGE DRIVE WORCESTER, NEW HAMPSHIRE Project No. 14-15-067

This memorandum serves as a Geotechnical Summary Report for the referenced project. The edited report reflects additional subgrade exploration and geotechnical review. The contents of this report are subject to the attached *Limitations*.

SITE & PROJECT DESCRIPTION

Present site development includes an existing, single-story commercial building with associated pavement and landscape areas. Based on review of the *Site Plan*, grades around the site vary from elevation \approx 933-936 ft. There are drainage swales along the roadways (to the south and east) extending to elevation \approx 928-929 ft. There is also a large ledge outcrop along the NE corner of the site (within the perimeter woodlands). There are no wetlands delineated on the *Site Plan*. JTC has limited knowledge of past construction, development and/or use of the property. There is some evidence of structural distress (movement and opening) along the NE corner of the building. This study did not include a structural assessment of the building.



The project includes a new emergency safety building. The building is to consist of a singlestory, steel framed structure to occupy a similar footprint (\approx 12,000 ft²). It is proposed to re-use the existing foundation for support of the new building. More specifically, we understand that it is intended to modify the existing foundation with additional column supports. The new building is an Emergency Control Center and the design loads are expected to increase approximately 35% compared to the design loads on the existing structure (built in the 1960's).

The purpose of this study is to provide a geotechnical evaluation as it pertains to foundation design and associated construction as required by the *Massachusetts State Building Code*. This report does not include an environmental assessment relative to oil, gasoline, solid waste and/or other hazardous materials. The environmental conditions of the property should be addressed by others as necessary. This study also does not include review of site design or construction issues such as infiltration systems, dry wells, retaining walls, underground utilities, slope stability, temporary shoring, crane pads or other site and/or temporary design unless specifically addressed herein.

SUBSURFACE EXPLORATION & LABORATORY TESTINGS

Test Borings

The subsurface exploration program included the completion of four (4) test borings completed around the building. The test borings (B1 to B4) were advanced to depths of about \approx 20-27 ft utilizing 4¹/₄-inch hollow stem augers. Five (5) subsequent test borings (B5 to B9) were recently completed inside the building to further review the subgrade. Soil samples were typically retrieved at no greater than 5 ft intervals with a 2-inch diameter split-spoon sampler. Standard Penetration Tests (SPTs) were performed at the sampling intervals in general accordance with ASTM-D1586 (*Standard Method for Penetration Test and Split-Barrel Sampling of Soils*). Field descriptions and penetration resistance of the soils encountered, observed depth to groundwater, depth to apparent bedrock refusal and other pertinent data are contained on the attached *Test Boring Logs*. The test holes were located in the field referencing existing site features. These locations are illustrated on the enclosed *Test Boring Location Plan*.

Test Pits

Seven (7) Test Pits were excavated along the existing perimeter foundation to review the existing foundation and associated subgrade conditions. The initial three (3) Test Pits (TP1 to TP3) were reviewed by the Structural Engineer (no logs provided) with the subsequent four (4) Test Pits (TP4 to TP7) reviewed and logged by JTC. The *Test Pit Logs* by JTC are attached for review.

Laboratory Testing

Eleven (11) selected split-spoon samples obtained from the test bores were submitted to our laboratory for sieve analyses and in-situ moisture per ASTM Standards. Two (2) samples were also submitted for Organic Content (ASTM D2974). The purpose of the testing was to assess engineering characteristics for design and to assess the suitability of the site soils for re-use as structural fill on the project. The test results are attached for review.



EXISTING FOUNDATION

The perimeter foundation was reviewed with the excavation of test pits. The test pit indicate a shallow spread footing foundation (about \approx 4-5 ft below grade). The footing width appears to vary from \approx 3-7 ft.

SUBGRADE CONDITIONS

The subsurface conditions include (1) undocumented Fill, (2) buried Organic soils, (3) silty Glacial Glacial deposits then (4) deep Bedrock. The presence of the Fill & buried Organic soils suggest a filled wet area.

Fill was encountered at all the test bore locations to depths of \approx 4-10 ft. The Fill appears to be reworked site soils which include a brown, Sand & Silt, little gravel. Some deeper Granular Fill (Sand & Gravel, trace silt) was present below 5 ft @ B1. The Granular Fill may have been used in a wet condition. The Fill varies from loose to medium dense suggesting uncontrolled placement and compaction. Some of the deeper Fill was presumably placed in a wet condition. Given the presence of loose and questionable Fill, the additional test pits (TP4 to TP6) were excavated adjacent to the existing building. The test pits indicate deep Fill which, in most cases, was not penetrated to \approx 8-9 ft given groundwater seepage and excavation stability. The test pits appear to indicate more stable and granular Fill based on visual assessment.

Buried Organic Sand & Silt was encountered in 3 of the 4 test bores at varying depths of about \approx 4-11 ft (being \approx 1-2 ft in thickness). In test bores B1 & B2, the Organic soils are present below the foundation. Organic testing indicates about \approx 3-4% organic matter by weight.

Given concern with regards to Fill & Organic soils in proximity to the shallow foundation, additional test bores were completed inside the building. The additional test bores indicate Fill about \approx 6-10 ft in depth but generally compact and with no organic soils. Again, the Fill appears to be re-worked site soils (Sand & Silt, little gravel). Based on this further study, it appears the subgrade conditions below the immediate building footprint are stable.

The parent site soils include stable but silty Glacial deposits. These soils include a brown to grey, Silt & Sand w/ gravel (sandy Silt w/ gravel). Occasional lenses of Rust Brown Sand and embedded in these glacio-fluvial deposits. Gradation testing indicates a Silt (\approx 40-47% fines that pass the No. 200 sieve) with some sand, some gravel. Similar to the Fill (re-worked site soils), the fine-grained composition of these soils renders them moisture sensitive, poor-draining and frost susceptible. The glacial soils are stable and compact.

Auger Refusal, presumably Bedrock, was met at depths of ≈ 19 ft & ≈ 24 ft at B4 & B3 respectively. Test bores B1 & B2 did not meet refusal to 27 ft.

Groundwater was encountered in the test holes at depths of \approx 5-8 ft below grade. Soil samples below these depths were saturated and wet. It should be noted that fluctuations in the level of the groundwater may occur due to seasonal variations in rainfall, temperature, flooding, utilities and other factors differing from the time of the measurements.



FOUNDATION SUBGRADE RECOMMENDATIONS

Based on further review, the subgrade conditions below the existing foundation appear to include either compact Fill or stable Glacial soils. Although present near and below the foundation, the loose Fill and buried Organic soils appear to be located at least \approx 4-5 ft outside the building footprint. This may suggest prior controlled Fill placement within the specific limits of the building pad (with uncontrolled Fill placement beyond the foundation limits). Again, there were no organic soils identified within the building and the Fill was more compact (especially in comparison to the exterior fill).

Based on this study, the footing subgrade (compacted Fill or parent Glacial soils) are considered suitable for an allowable bearing capacity of 4 ksf (FS=3). The allowable bearing capacity may be increased a third $(\frac{1}{3})$ when considering transient loads such as wind or seismic. The bearing capacity is contingent upon the perimeter strip footings and isolated column footings being no less than 2 ft and 3 ft in width respectively. For footings less than 3 ft in lateral dimension, the allowable bearing capacity should be reduced to one-third and multiplied by the least lateral footing dimension in feet. Foundation settlement should be less than 1 inch with differential settlement less than $\frac{1}{2}$ inch. The settlement should be elastic and occur during construction. Exterior footings shall be provided with at least 4 ft of frost protection. Proper frost protection should be necessary during winter construction.

The subsurface conditions were reviewed with respect to seismic criteria set forth in the *Massachusetts State Building Code (Eighth Edit)*. Based on the relative density of the soils and the depth to groundwater, the site is not susceptible to liquefaction in the event of an earthquake (*Section 1804.6*). Based on interpretation of the *Building Code*, the *Site Classification* (Section 9.4.1.2.1) is "D" (Stable Soil).

We trust the contents of this memorandum report are responsive to your needs at this time. Should you have any questions or require additional assistance, please do not hesitate to contact our office.

Enclosures kmm50/jtc14/WorcesterDPW2.rpt



TABLE 1

Emergency Safety Building 2 Coppage Drive Worcester, MA

Recommended Soil Gradation & Compaction Specifications

| <i>Clean Granular Fill</i> (Select Crushed Gravel Fill) | | | |
|--|------------------------------|--|--|
| SIEVE SIZE | PERCENT PASSING BY WEIGHT | | |
| 3 inch | 100 | | |
| 3/4 inch | 60-90 | | |
| No. 4 | 20-70 | | |
| No. 200 | 2-8 | | |

NOTE:

For minimum 8-inch base below the concrete floor slab-on-grade For minimum 16-inch base for exterior concrete slabs exposed to frost For minimum 24-inch base below aprons, entrances and ramps

| SIEVE SIZE | PERCENT PASSING BY WEIGHT |
|------------|------------------------------|
| 5 inch | 100 |
| 3/4 inch | 60-100 |
| No. 4 | 20-80 |
| No. 200 | 0-10 |

Structural Fill

NOTE:

For use as structural load support below the foundations For use as backfill behind unbalanced foundation/retaining walls A one-inch crushed stone should be used in wet conditions

Structural Fill placed beneath the foundation should include the *Footing Zone of Influence* which is defined as that area extending laterally one foot from the edge of the footing then outward and downward at a 1H:1V splay. Structural Fill should be placed in loose lifts not exceeding 12 inches for heavy vibratory rollers and 8 inches for vibratory plate compactors. All Structural Fill should be compacted to at least 95 percent of maximum dry density as determined by the Modified Proctor Test (ASTM-D1557). Structural Fill should be compacted within $\pm 3\%$ of optimum moisture content. The adequacy of the compaction efforts should be verified by field density testing which is also a requirement of the *Massachusetts State Building Code*.


LIMITATIONS

Explorations

- 1. The analyses, recommendations and designs submitted in this report are based in part upon the data obtained from preliminary subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.
- 2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the individual test pit and/or boring logs.
- 3. Water level readings have been made in the test pits and/or test borings under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time the measurements were made.

Review

- 4. It is recommended that this firm be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the recommendations provided herein.
- 5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by John Turner Consulting, Inc.

Construction

6. It is recommended that this firm be retained to provide geotechnical engineering services during the earthwork phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

Use of Report

- 7. This report has been prepared for the exclusive use of the City of Worcester in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.
- 8. This report has been prepared for this project by John Turner Consulting, Inc. This report was completed for preliminary design purposes and may be limited in its scope to complete an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to preliminary geotechnical design considerations.

Test Boring Location Plan & Test Boring Logs



| • <u>cc</u> | NSULTIN | | | | | TEST BOP | RING LOG | | |
|-------------|--|----------------|----------------------|------------------------------|----------------------------|--------------------------------|-------------------|-------------------|-----|
| 1 | \checkmark | JO. | | | CLIENT: | City of Worcester-Depa | artment of Pub | lic Works | |
| 5 | | Ģ, | | | PROJECT: | Geotechnical Evaluatio | n Services | | |
| | 6 3 | GEOTECHN | | ONSTRUCTION | LOCATION: | 2 Coppage Drive, Word | cester, MA | | |
| | • • | | | | PROJECT No: | 14-15-00067 | | | |
| | JOHN | TURNER | CONSUL | TING, INC. | BORING No: | B(I)-5 | | | |
| | | 19 DOVI | ER STRE | ET | DATE: | 11/5/2014 | | | |
| | | DOVER | , NH 038 | 320 | LOCATION: | Northeast Interior Corn | er of Building | See Attached Plan | n |
| | (603) | 749-1841 | www.con | sultjtc.com | SURFACE EL: | el. 936 | | | |
| TYPE O | F BORIN | iG: | 3 1/4" Ca | asing w/ Direct Push | | GROUNDWATER OBS | SERVATIONS | | |
| DRILLI | NG Co: | | Soil Expl | oration, Inc. | DATE: | DEPTH: | | TIME: | |
| RIG: | | | Geoprobe | e 6610 | 11/5/2014 | 7' | | Upon Completion | |
| DRILLE | R: | | Brian Ha | rt | | | | | |
| JTC REI | P.: | | Judson Z | achar | | | | | |
| | - | | | | | | | | |
| FT | NO. | SAMPLE | REC. | SOIL & ROC | K CLASSIFICATION- | DESCRIPTION | STRATUM | BLOWS | SPT |
| | | DEPTH | (IN.) | BUF | RMEISTER SYSTEM (| SOIL) | CHANGE | PER | (N) |
| | | (FT.) | | U.S. CORPS | OF ENGINEERS SYS | TEM (ROCK) | (FT.) | 6 INCHES | |
| 0-1 | S-1 | 0-2 | 8 | 4" Concrete Pad | | | 4" | 11-10-8-7 | 18 |
| 1-2 | | | | 4 | | (FILL) | | | |
| 2-3 | S-2 | 2-4 | 4 | Brown, Moist, F-C SAN | ND, s. Gravel, s. Silt | | ┝───┼ | 4-4-3-3 | 7 |
| 3-4 | | | | 4 | | | ┞────┼ | | |
| 4-5 | | | 12 | | | | | 16 14 17 22 | 21 |
| 5-6 | S- 3 | 5-7 | 12 | Brown, V. Moist, F-C S | SAND, s. Gravel, s. Silt | | | 16-14-17-22 | 31 |
| 0-/ 7.8 | S 4 | 7.0 | 12 | Proven Saturated E.C. | SAND a Graval a Silt | | | 14 22 28 20 | 50 |
| 7-0 8-9 | 5-4 | 1-9 | 12 | Brown, Saturated, 1-C | SAND, S. Olavel, S. Shi | | | 14-22-28-30 | 50 |
| 9-10 | | | | | | | 10' | | |
| 10-11 | S-5 | 10-12 | 13 | Brown, Saturated, SILT | & F-C Sand, tr. Gravel | | 10 | 6-7-9-9 | 16 |
| 11-12 | | | | | | (Silts/Sands) | | | |
| 12-13 | S-6 | 12-14 | 8 | Brown, Saturated, SILT | & F-C Sand, l. Gravel | | | 7-8-10-10 | 18 |
| 13-14 | | | | Boring Terminated @ | -14' below top of Conce | ete Pad. | | | |
| 14-15 | | | | | | | | | |
| 15-16 | | | | | | | | | |
| 16-17 | | | | - | | | | | |
| 17-18 | | | | 4 | | | | | |
| 18-19 | | | | | | | | | |
| 19-20 | | | | 4 | | | | | |
| 20-21 | | | | | | | | | |
| 22-23 | | | | 1 | | | ┝───┼ | | |
| 23-24 | | | | 1 | | | | | |
| 24-25 | | | | 1 | | | | | |
| 25-26 | | | |] | | | | | |
| 26-27 | | | | 1 | | | | | |
| 27-28 | | | | 1 | | | | | |
| 28-29 | | | | 4 | | | └───┤ | | |
| 29-30 | | | | 4 | | | ┝───┤ | | |
| 30-31 | | | | 4 | | | | | |
| 31-32 | 70 | | | | | | | | I |
| REMAR | KS: | | | | | | | | |
| Standard | Donotes | tion Tests (| $(\mathbf{DT}) = 1/$ | 10# hamman falling 20 |)" (ACTM D1596) | | | | |
| Blows | Standard Penetration 1ests $(SP1) = 140\pi$ nammer falling 50° (AS1NI D1580) Blows are per 6 inches with a 24" long by 2" O D by 1 3/8" I D split spoon sampler unless otherwise noted | | | | | | | | |
| S = snlit | Shows are per o menes with a 24 rong by 2 o.D. by 1 5/6 r.D. spin spoon sampler unless otherwise noted S = split-spoon sample: C = rock core sample: U = undisturbed | | | | | | | | |
| REMAR | Spoon's | stratification | lines renre | sent the approximate bo | undary hetween soil type | s and the transition may be | gradual Water | | |
| | level | readings hav | e been maa | le in the test borings at th | imes and under condition | s stated in the test boring la | ogs. Fluctuations | 5 | |
| | in the | level of the | groundwate | er may occur due to othe | r factors than those prese | ent at the time measurement | ts were made. | | |
| | Prop | ortions used: | trace (0-1 | 0%), little (10-20%), so | ome (20-35%), and (35-5 | 50%) | | | |

| • <u>co</u> | NSULTIN | | | | | TEST BOP | RING LOG | i | |
|---|---|----------------|-------------------|------------------------------|---------------------------|--------------------------------|------------------|-----------------|-----|
| 1 | \checkmark | JO. | | | CLIENT: | City of Worcester-Depa | artment of Pub | lic Works | |
| 5 | | ς, J | | J inc | PROJECT: | Geotechnical Evaluatio | n Services | | |
| | 10 3 | GEOTECHN | NICAL • C | ONSTRUCTION | LOCATION: | 2 Coppage Drive, Word | cester, MA | | |
| | | | | | PROJECT No: | 14-15-00067 | | | |
| | JOHN | TURNER | CONSUL | TING, INC. | BORING No: | B(I)-6 | | | |
| | | 19 DOVI | ER STRE | ET | DATE: | 11/5/2014 | | | |
| | | DOVER | , NH 038 | 320 | LOCATION: | East Interior Side of Bu | uilding; See At | tached Plan | |
| | (603) | 749-1841 | www.con | sultjtc.com | SURFACE EL: | el. 936 | | | |
| TYPE O | F BORIN | IG: | 3 1/4" Ca | sing w/ Direct Push | | GROUNDWATER OBS | SERVATIONS | | |
| DRILLIN | NG Co: | | Soil Expl | oration, Inc. | DATE: | DEPTH: | | TIME: | |
| RIG: | | | Geoprobe | e 6610 | 11/5/2014 | 6'6'' | | Upon Completion | |
| DRILLE | R: | | Brian Ha | rt | | | | | |
| JTC REF | P.: | | Judson Z | achar | | | | | |
| | | | | | | | | | |
| FT | NO. | SAMPLE | REC. | SOIL & ROCI | K CLASSIFICATION-I | DESCRIPTION | STRATUM | BLOWS | SPT |
| | | DEPTH | (IN.) | BUR | MEISTER SYSTEM (S | SOIL) | CHANGE | PER | (N) |
| | | (FT.) | | U.S. CORPS | OF ENGINEERS SYS | FEM (ROCK) | (FT.) | 6 INCHES | |
| 0-1 | S-1 | 0-2 | 10 | 4" Concrete Pad | | | 4" | 17-14-10-10 | 24 |
| 1-2 | | | | _ | | (FILL) | | | |
| 2-3 | S-2 | 2-4 | 11 | Brown, Moist, F-C SAN | ID, s. Gravel, s. Silt | | | 14-14-15-18 | 29 |
| 3-4 | | | | 1 | | | | | |
| 4-5 | | | | 4 | | | | | |
| 5-6 | S-3 | 5-7 | 7 | Brown, Moist, F-C SAN | D, s. Gravel, s. Silt | | 6' | 15-15-20-20 | 35 |
| 6-7 | | | | - | | (Silts/Sands) | | | |
| 7-8 | S-4 | 7-9 | 13 | Brown, Saturated, SILT | , s. Sand, s. Gravel | | | 13-15-28-27 | 43 |
| 8-9 | | | | - | | | | | |
| 9-10 | | | | | | | | | |
| 10-11 | S-5 | 10-12 | 12 | Brown, Saturated, SILT | & F-C Sand, tr. Gravel | | | 7-8-10-11 | 18 |
| 11-12 | 5.6 | 10.14 | 16 | Durana Catanata I CILT | & E.C. Sand J. Connel | | | 8 0 12 11 | 21 |
| 12-13 | 3-0 | 12-14 | 10 | Brown, Saturated, SIL1 | 14' helew ten of Conor | usto Dod | | 8-9-12-11 | 21 |
| 14-15 | | | | boring rerininateu @ | -14 below top of Coller | ete I au. | | | |
| 14-15 | | | | | | | | | |
| 16-17 | | | | 1 | | | | | |
| 17-18 | | | | | | | | | |
| 18-19 | | | | | | | | | |
| 19-20 | | | | | | | | | |
| 20-21 | | | | | | | | | |
| 21-22 | | | | | | | | | |
| 22-23 | | | | 1 | | | | | |
| 23-24 | | | | 1 | | | | | |
| 24-25 | | | | 4 | | | ļ ļ | | |
| 25-26 | | | | 4 | | | | | |
| 26-27 | | | | 4 | | | | | |
| 27-28 | | | | 4 | | | | | ļ |
| 28-29 | 1 | | | 4 | | | | | |
| 29-30 | | | | 4 | | | | | |
| 31.32 | | | | 1 | | | | | |
| DEMAD | VS. | | | | | | | | |
| ALMAK. | 11 (3) | | | | | | | | |
| Standard | Penetra | tion Tests (| SPT) – 1/ | 10# hammer falling 30 | " (ASTM D1586) | | | | |
| Blows at | Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted | | | | | | | | |
| S = split-spoon sample; $C = $ rock core sample; $U = $ undisturbed | | | | | | | | | |
| REMAR | KS: The | stratification | lines repre | sent the approximate hou | undary between soil types | s and the transition may be | gradual. Water | | |
| | level | readings hav | e been maa | le in the test borings at ti | mes and under condition | s stated in the test boring lo | ogs. Fluctuation | \$ | |
| | in the | e level of the | groundwate | er may occur due to other | factors than those prese | ent at the time measurement | s were made. | | |
| | Prop | ortions used: | trace (0-1 | 0%), little (10-20%), so | me (20-35%), and (35-5 | 50%) | | | |

| • <u>cc</u> | NSULTIN | | | | | TEST BOP | RING LOG | | | |
|-------------|---|----------------|-------------|------------------------------|----------------------------|---------------------------------|-------------------|-----------------|-----|--|
| 1 | \checkmark | JO. | | | CLIENT: | City of Worcester-Depa | artment of Pub | lic Works | | |
| 5 | | ç, | | | PROJECT: | Geotechnical Evaluatio | n Services | | | |
| | 6 3 | GEOTECHN | NICAL • C | ONSTRUCTION | LOCATION: | 2 Coppage Drive, Word | ester, MA | | | |
| | | | | | PROJECT No: | 14-15-00067 | | | | |
| | JOHN | TURNER | CONSUL | TING, INC. | BORING No: | B(I)-7 | | | | |
| | | 19 DOVI | ER STRE | ET | DATE: | 11/5/2014 | | | | |
| | | DOVER | . NH 038 | 320 | LOCATION: | Center of Building; See | Attached Plar | 1 | | |
| | (603) | 749-1841 | www.con | sultjtc.com | SURFACE EL: | el. 936 | | | | |
| TYPE O | F BORIN | IG: | 3 1/4" Ca | sing w/ Direct Push | | GROUNDWATER OBS | ERVATIONS | | | |
| DRILLI | NG Co: | | Soil Expl | oration, Inc. | DATE: | DEPTH: | | TIME: | | |
| RIG: | | | Geoprobe | e 6610 | 11/5/2014 | 7' | | Upon Completion | | |
| DRILLE | R: | | Brian Ha | rt | | | | | | |
| JTC REI | P.: | | Judson Z | achar | | | | | | |
| | | | | | | | | | | |
| FT | NO. | SAMPLE | REC. | SOIL & ROC | K CLASSIFICATION- | DESCRIPTION | STRATUM | BLOWS | SPT | |
| | | DEPTH | (IN.) | BUF | RMEISTER SYSTEM (| SOIL) | CHANGE | PER | (N) | |
| | | (FT.) | | U.S. CORPS | OF ENGINEERS SYS | TEM (ROCK) | (FT.) | 6 INCHES | | |
| 0-1 | S-1 | 0-2 | 8 | 4" Concrete Pad | | | 4" | 30-39-32-38 | 71 | |
| 1-2 | | | | T | | (Silt/Sand) | | | | |
| 2-3 | S-2 | 2-4 | 11 | Gray, Moist, SILT, s. Sa | and, l. Gravel | | | 22-24-26-25 | 50 | |
| 3-4 | | | | 1 | | | | | | |
| 4-5 | | | | | | | | | | |
| 5-6 | S-3 | 5-7 | 14 | Gray, Moist, SILT, s. Sa | and, l. Gravel | | | 22-34-38-42 | 72 | |
| 6-7 | | | | | | | | | | |
| 7-8 | 7-8 S-4 7-9 9 Gray, Moist, SILT, s. Sand, l. Gravel | | | | | | | 42-45-50/2" | 95+ | |
| 8-9 | | | | Split Spoon Refusal @ | -8'2" below top of Con | crete Pad. | | | | |
| 9-10 | | | | Boring Terminated. | | | | | | |
| 10-11 | | | | | | | | | | |
| 11-12 | | | | | | | | | | |
| 12-13 | | | | | | | | | | |
| 13-14 | | | | - | | | | | | |
| 14-15 | | | | - | | | | | | |
| 15-16 | | | | 4 | | | | | | |
| 16-17 | | | | | | | | | | |
| 17-18 | | | | - | | | | | | |
| 18-19 | | | | - | | | | | | |
| 19-20 | | | | | | | | | | |
| 20-21 | | | | | | | | | | |
| 21-22 | | | | | | | | | | |
| 23-23 | | | | 1 | | | | | | |
| 24-25 | | | | 1 | | | | | | |
| 25-26 | | | 1 | 1 | | | | | | |
| 26-27 | | | | 1 | | | | | | |
| 27-28 | | | | 1 | | | | | | |
| 28-29 | | | |] | | | | | | |
| 29-30 | | | |] | | | | | | |
| 30-31 | | | | 1 | | | | | | |
| 31-32 | | | | | | | | | | |
| REMAR | KS: | | | | | | | | | |
| | | | | | | | | | | |
| Standard | Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586) | | | | | | | | | |
| Blows an | Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted | | | | | | | | | |
| S = split | S = split-spoon sample; C = rock core sample; U = undisturbed | | | | | | | | | |
| REMARI | KS: The | stratification | lines repre | esent the approximate bo | undary between soil type. | s and the transition may be | gradual. Water | | | |
| | level | readings hav | ve been maa | le in the test borings at ti | imes and under condition | as stated in the test boring lo | ogs. Fluctuations | 5 | | |
| | in the | e level of the | groundwate | er may occur due to othe | r factors than those prese | ent at the time measurement | s were made. | | | |
| | Prope | ortions used: | trace (0-1 | 0%), little (10-20%), so | ome (20-35%), and (35-5 | 50%) | | | | |

| • <u>co</u> | NSULTIN | | | | | TEST BOF | RING LOG | i | |
|---|---|----------------|-------------|------------------------------|----------------------------|--------------------------------|------------------|----------------------|-----|
| 1 | \checkmark | JO. | | | CLIENT: | City of Worcester-Depa | artment of Pub | lic Works | |
| 5 | | | | I inc | PROJECT: | Geotechnical Evaluation | n Services | | |
| | 0 3 | GEOTECHN | NICAL • C | ONSTRUCTION | LOCATION: | 2 Coppage Drive, Word | cester, MA | | |
| | | | | | PROJECT No: | 14-15-00067 | | | |
| | JOHN | TURNER | CONSUL | TING, INC. | BORING No: | B(I)-8 | | | |
| | | 19 DOVI | ER STRE | ET | DATE: | 11/5/2014 | | | |
| | | DOVER | , NH 038 | 320 | LOCATION: | Northwest Interior Corr | ner of Building | g; See Attached Pla | n |
| | (603) | 749-1841 | www.con | sultjtc.com | SURFACE EL: | el. 936 | | | |
| TYPE O | F BORIN | IG: | 3 1/4" Ca | sing w/ Direct Push | | GROUNDWATER OBS | SERVATIONS | | |
| DRILLIN | NG Co: | | Soil Expl | oration, Inc. | DATE: | DEPTH: | | TIME: | |
| RIG: | | | Geoprobe | e 6610 | 11/5/2014 | 8' | | Upon Completion | |
| DRILLE | R: | | Brian Ha | rt | 11/5/2014 | 6'6'' | 2 H | Irs After Completion | 1 |
| JTC REF | ` .: | | Judson Z | achar | | | | | |
| | | | | | 8 | | | | |
| FT | NO. | SAMPLE | REC. | SOIL & ROCI | K CLASSIFICATION-I | DESCRIPTION | STRATUM | BLOWS | SPT |
| | | DEPTH | (IN.) | BUR | MEISTER SYSTEM (S | SOIL) | CHANGE | PER | (N) |
| | | (FT.) | | U.S. CORPS | OF ENGINEERS SYS | ГЕМ (ROCK) | (FT.) | 6 INCHES | |
| 0-1 | S-1 | 0-2 | 8 | 4" Concrete Pad | | | 4" | 20-19-18-21 | 37 |
| 1-2 | | | | T | | (Reworked Silts/Sands) | | | |
| 2-3 | S-2 | 2-4 | 12 | Gray, Moist, SILT, s. Sa | und, l. Gravel | | | 13-13-12-10 | 25 |
| 3-4 | | | | 1 | | | | | |
| 4-5 | | | |] | | | | | |
| 5-6 | S-3 | 5-7 | 10 | Gray, Moist, SILT, s. Sa | and, l. Gravel | | | 26-28-33-37 | 61 |
| 6-7 | | | | | | | | | |
| 7-8 | S-4 | 7-9 | 16 | Gray, Moist, SILT, s. Sa | und, l. Gravel | | 8' | 11-10-10-9 | 20 |
| 8-9 | | | | | | (Silts/Sands) | | | |
| 9-10 | | | | | | | | | |
| 10-11 | S-5 | 10-12 | 14 | Brown, Saturated, SILT | & F-C Sand, tr. Gravel | | | 9-9-14-17 | 23 |
| 11-12 | | | | | | | | | |
| 12-13 | S-6 | 12-14 | 14 | Brown, Saturated, SILT | & F-C Sand, l. Gravel | | | 10-10-11-25 | 21 |
| 13-14 | | | | Boring Terminated @ | -14' below top of Concr | ete Pad. | | | |
| 14-15 | | | | | | | | | |
| 15-16 | | | | - | | | | | |
| 16-17 | | | | - | | | | | |
| 17-18 | | | | | | | | | |
| 18-19 | | | | | | | | | |
| 19-20 | | | | 4 | | | | | |
| 20-21 | | | | - | | | | | |
| 21-22 | | | | 4 | | | | | |
| 22-23 | | | | 1 | | | | | |
| 24-25 | | | | 1 | | | | | |
| 25-26 | | | | 1 | | | | | |
| 26-27 | | | | 1 | | | | | |
| 27-28 | | | . | 1 | | | | | |
| 28-29 | | | | 1 | | | | | |
| 29-30 | | | | 1 | | | | | |
| 30-31 | | | |] | | | | | |
| 31-32 | | | | | | | | | |
| REMAR | KS: | | | | | | | | |
| | | | | | | | | | |
| Standard | Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586) | | | | | | | | |
| Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted | | | | | | | | | |
| S = split | S = split-spoon sample; C = rock core sample; U = undisturbed | | | | | | | | |
| REMARI | KS: The | stratification | lines repre | esent the approximate bou | undary between soil type: | s and the transition may be | gradual. Water | | |
| | level | readings hav | e been maa | le in the test borings at ti | mes and under condition | s stated in the test boring lo | ogs. Fluctuation | \$ | |
| | in the | e level of the | groundwate | er may occur due to other | r factors than those prese | ent at the time measurement | ts were made. | | |
| | Prope | ortions used: | trace (0-1 | 0%), little (10-20%), so | me (20-35%), and (35-5 | 50%) | | | |

| • <u>cc</u> | NSULTIN | | | | | TEST BOP | RING LOG | ì | |
|-------------|---|----------------|-------------|------------------------------|----------------------------|--------------------------------|------------------|---------------------|-----|
| The | \checkmark | NO. | | | CLIENT: | City of Worcester-Depa | artment of Pub | lic Works | |
| 5 | | ς, J | | inc | PROJECT: | Geotechnical Evaluatio | n Services | | |
| | 10 3 | GEOTECHN | NICAL • C | ONSTRUCTION | LOCATION: | 2 Coppage Drive, Word | cester, MA | | |
| | | | | | PROJECT No: | 14-15-00067 | | | |
| | JOHN | TURNER | CONSUL | TING, INC. | BORING No: | B(I)-9 | | | |
| | | 19 DOVI | ER STRE | ET | DATE: | 11/5/2014 | | | |
| | | DOVER | , NH 038 | 320 | LOCATION: | Southeast Interior Corn | er of Building | ; See Attached Plan | n |
| | (603) | 749-1841 | www.con | sultjtc.com | SURFACE EL: | el. 936 | | | |
| TYPE O | F BORIN | NG: | 3 1/4" Ca | using w/ Direct Push | | GROUNDWATER OBS | SERVATIONS | | |
| DRILLIN | NG Co: | | Soil Expl | oration, Inc. | DATE: | DEPTH: | | TIME: | |
| RIG: | | | Geoprobe | e 6610 | 11/5/2014 | 6' | | Upon Completion | |
| DRILLE | R: | | Brian Ha | rt | | | | | |
| JTC REI | P.: | | Judson Z | achar | | | | | |
| | | | | | | | | | |
| FT | NO. | SAMPLE | REC. | SOIL & ROC | K CLASSIFICATION-I | DESCRIPTION | STRATUM | BLOWS | SPT |
| | | DEPTH | (IN.) | BUR | MEISTER SYSTEM (S | SOIL) | CHANGE | PER | (N) |
| | | (FT.) | | U.S. CORPS | OF ENGINEERS SYS | TEM (ROCK) | (FT.) | 6 INCHES | |
| 0-1 | S-1 | 0-2 | 6 | 4" Concrete Pad | | | 4" | 9-7-8-8 | 15 |
| 1-2 | | | | 4 | | (FILL) | | | |
| 2-3 | S-2 | 2-4 | 10 | Brown, Moist, F-C SAN | ID, s. Gravel, s. Silt | | | 12-9-7-9 | 16 |
| 3-4 | | | | 4 | | | \vdash | | ļ |
| 4-5 | | | | | | | | | |
| 5-6 | S-3 | 5-7 | 5 | Brown, V. Moist, F-C S | AND, s. Gravel, s. Silt | | 6' | 4-5-4-4 | 9 |
| 6-7 | | | | | | (Silts/Sands) | | | |
| 7-8 | S- 4 | 7-9 | 13 | Brown, Saturated, SIL1 | & F-C Sand, tr. Gravel | | | 10-21-22-16 | 43 |
| 8-9 | | | | - | | | | | |
| 9-10 | S 5 | 10.12 | 17 | Decrup Saturated SUT | PECSand to Croval | | | 10 22 20 22 | 61 |
| 10-11 | 3-3 | 10-12 | 17 | BIOWII, Saturated, SIL1 | & F-C Salid, II. Glavel | | | 18-33-28-32 | 01 |
| 12-13 | | | | Boring Terminated @ | -12' below top of Concr | ete Pad | | | |
| 13-14 | | | | boring rerininateu e | -12 below top of Coner | cic i au. | | | |
| 14-15 | | | | | | | | | |
| 15-16 | | | | 1 | | | | | |
| 16-17 | | | | | | | | | |
| 17-18 | | | | | | | | | |
| 18-19 | | | | | | | | | |
| 19-20 | | | | | | | | | |
| 20-21 | | | | - | | | | | |
| 21-22 | | | | 4 | | | | | |
| 22-23 | | | | 4 | | | | | |
| 23-24 | | | | 4 | | | └───┤ | | |
| 24-25 | | | | 4 | | | | | |
| 25-26 | | | | 4 | | | ├ | | |
| 20-27 | | | | 1 | | | | | |
| 28-29 | | | | 1 | | | ├ | | |
| 29-30 | | | | 1 | | | | | |
| 30-31 | | | . | 1 | | | | | |
| 31-32 | | | | | | | | | |
| REMAR | KS: | | | | | | | | |
| | | | | | | | | | |
| Standard | standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586) | | | | | | | | |
| Blows at | Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted | | | | | | | | |
| S = split | S = split-spoon sample; C = rock core sample; U = undisturbed | | | | | | | | |
| REMARI | KS: The | stratification | lines repre | esent the approximate bou | undary between soil type: | s and the transition may be | gradual. Water | | |
| | level | readings hav | e been maa | le in the test borings at ti | mes and under condition | s stated in the test boring le | ogs. Fluctuation | \$ | |
| | in the | e level of the | groundwate | er may occur due to other | r factors than those prese | nt at the time measurement | ts were made. | | |
| | Prop | ortions used: | trace (0-1 | 0%), little (10-20%), so | me (20-35%), and (35-5 | 0%) | | | |

Geotechnical Laboratory Testing Reports











Supplemental Data



GEOTECHNICAL SUMMARY REPORT FOR: EMERGENCY SAFETY BUILDING 2 COPPAGE DRIVE WORCESTER, MASSACHUSETTS

TO: CITY OF WORCESTER DEPARTMENT OF PUBLIC WORKS 20 EAST WORCESTER STREET WORCESTER, MA 01604

JTC PROJECT NO: 14-15-067

JOHN TURNER CONSULTING

NH MA ME CT RI VT

19 DOVER STREET DOVER, NH 03820 T 603.749.1841 F 603.516.6851 66 SOUTHGATE STREET WORCESTER MA 01603 T 508.505.0126 6 CLINTON AVENUE WESTFIELD MA 01085 T 413.642.0138 CONSULTJTC.COM

73 RAINMAKER DRIVE Portland ME 04103-1291 T 207.883.7878

TABLE OF CONTENTS

Geotechnical Summary Report

Boring Location Plan & Boring Logs

Soil Laboratory Reports

Site Photographs

Geotechnical Summary Report



GEOTECHNICAL SUMMARY REPORT

Prepared by:

JOHN TURNER CONSULTING, INC.

19 DOVER STREET DOVER, NEW HAMPSHIRE P. 603-749-1841/F. 603-516-6851 consultJTC.com

TO: City of Worcester Department of Public Works 20 East Worcester Street Worcester, MA 01604



- FROM:Judson Zachar, P.E.Kevin Martin, P.E.Staff EngineerGeotechnical Engineer
- **DATE:** October 14, 2014
- RE: GEOTECHNICAL SUMMARY REPORT EMERGENCY SAFETY BUILDING 2 COPPAGE DRIVE WORCESTER, MASSACHUSETTS Project No. 14-15-067

This memorandum serves as a Geotechnical Summary Report for the referenced project. The contents of this report are subject to the attached *Limitations*.

SITE & PROJECT DESCRIPTION

Present site development includes an existing, single-story commercial building with associated pavement and landscape areas. Based on review of the *Site Plan*, grades around the site vary from elevation \approx 933-936 ft. There are drainage swales along the roadways (to the south and east) extending to elevation \approx 928-929 ft. There is also a large ledge outcrop along the NE corner of the site (within the perimeter woodlands). There are no wetlands delineated on the *Site Plan*. JTC has limited knowledge of past construction, development and/or use of the property.

The project includes a new emergency safety building. The building is to consist of a singlestory, steel framed structure to occupy a similar footprint (\approx 12,000 ft²). It is proposed to re-use the existing foundation for support of the new building. More specifically, we understand that it is intended to modify the existing foundation with additional column supports. The new building is an Emergency Control Center and the design loads are expected to increase approximately 35% compared to the design loads on the existing structure (built in the 1960's).



The purpose of this study is to provide a geotechnical evaluation as it pertains to foundation design and associated construction as required by the *Massachusetts State Building Code*. This report does not include an environmental assessment relative to oil, gasoline, solid waste and/or other hazardous materials. The environmental conditions of the property should be addressed by others as necessary. This study also does not include review of site design or construction issues such as infiltration systems, dry wells, retaining walls, underground utilities, slope stability, temporary shoring, crane pads or other site and/or temporary design unless specifically addressed herein.

SUBSURFACE EXPLORATION & LABORATORY TESTINGS

Test Borings

The subsurface exploration program included the completion of four (4) test borings completed around the building. The test borings (B1 to B4) were advanced to depths of about \approx 20-27 ft utilizing 4¹/₄-inch hollow stem augers. Soil samples were typically retrieved at no greater than 5 ft intervals with a 2-inch diameter split-spoon sampler. Standard Penetration Tests (SPTs) were performed at the sampling intervals in general accordance with ASTM-D1586 (*Standard Method for Penetration Test and Split-Barrel Sampling of Soils*). Field descriptions and penetration resistance of the soils encountered, observed depth to groundwater, depth to apparent bedrock refusal and other pertinent data are contained on the attached *Test Boring Logs*. The test holes were located in the field referencing existing site features. These locations are illustrated on the enclosed *Test Boring Location Plan*.

Test Pits

Seven (7) Test Pits were excavated along the existing perimeter foundation to review the existing foundation and associated subgrade conditions. The initial three (3) Test Pits (TP1 to TP3) were reviewed by the Structural Engineer (no logs provided) with the subsequent four (4) Test Pits (TP4 to TP7) reviewed and logged by JTC. The *Test Pit Logs* by JTC are attached for review.

Laboratory Testing

Six (6) selected split-spoon samples obtained from the test bores were submitted to our laboratory for sieve analyses and in-situ moisture per ASTM Standards. Two (2) samples were also submitted for Organic Content (ASTM D2974). The purpose of the testing was to assess engineering characteristics for design and to assess the suitability of the site soils for re-use as structural fill on the project. The test results are attached for review.

EXISTING FOUNDATION

The perimeter foundation was reviewed with the excavation of test pits. The test pit indicate a shallow spread footing foundation (about \approx 4-5 ft below grade). The footing width appears to vary from \approx 3-7 ft.



SUBGRADE CONDITIONS

The subsurface conditions include (1) undocumented Fill, (2) buried Organic soils, (3) silty Glacial Glacial deposits then (4) deep Bedrock. The presence of the Fill & buried Organic soils suggest a filled wet area.

Fill was encountered at all the test bore locations to depths of \approx 4-10 ft. The Fill appears to be reworked site soils which include a brown, Sand & Silt, little gravel. Some deeper Granular Fill (Sand & Gravel, trace silt) was present below 5 ft @ B1. The Granular Fill may have been used in a wet condition. The Fill varies from loose to medium dense suggesting uncontrolled placement and compaction. Some of the deeper Fill was presumably placed in a wet condition. Given the presence of loose and questionable Fill, the additional test pits (TP4 to TP6) were excavated adjacent to the existing building. The test pits indicate deep Fill which, in most cases, was not penetrated to \approx 8-9 ft given groundwater seepage and excavation stability. The test pits appear to indicate more stable and granular Fill based on visual assessment.

Buried Organic Sand & Silt was encountered in 3 of the 4 test bores at varying depths of about \approx 4-11 ft (being \approx 1-2 ft in thickness). In test bores B1 & B2, the Organic soils are present below the foundation. Organic testing indicates about \approx 3-4% organic matter by weight.

The parent site soils include stable but silty Glacial deposits. These soils include a brown to grey, Silt & Sand w/ gravel (sandy Silt w/ gravel). Occasional lenses of Rust Brown Sand and embedded in these glacio-fluvial deposits. Gradation testing indicates a Silt (\approx 40-47% fines that pass the No. 200 sieve) with some sand, some gravel. Similar to the Fill (re-worked site soils), the fine-grained composition of these soils renders them moisture sensitive, poor-draining and frost susceptible. The glacial soils are stable and compact.

Auger Refusal, presumably Bedrock, was met at depths of ≈ 19 ft & ≈ 24 ft at B4 & B3 respectively. Test bores B1 & B2 did not meet refusal to 27 ft.

Groundwater was encountered in the test holes at depths of \approx 5-8 ft below grade. Soil samples below these depths were saturated and wet. It should be noted that fluctuations in the level of the groundwater may occur due to seasonal variations in rainfall, temperature, flooding, utilities and other factors differing from the time of the measurements. This study was completed at a time of seasonally low groundwater (late, dry summer).

PRELIMINARY FOUNDATION SUBGRADE RECOMMENDATIONS

The subgrade conditions warrant concern for foundation support. There is deep, undocumented Fill below the foundation. Adjacent test bores indicate loose, wet Fill with buried organic soils. There is some noticeable structural distress in the NE corner of the building with cracking and separation. This distress may be associated with the deep Fill conditions. The subsequent test pits indicate deeper Fill but apparently of better quality.



Given the presence of deep Fill, buried Organic soils, structural distress and additional building load, we do not recommend re-using the existing foundation without modification or further study. Options include (1) Removal & Replacement, (2) Foundation Modification or (3) further Engineering study. Removal & Replacement (R&R) would involve removal of the existing foundation, fill, buried organic soils and other questionable matter from the *Footing Zone of Influence (FZOI)* to expose the competent glacial subgrade. The *FZOI* is that area extending laterally outward and downward at a 1H:1V projection from the edge of foundation (up to a maximum \approx 4 ft lateral distance from edge of footing). A controlled, compacted Structural Fill would then be placed in accordance with the *MSBC*. Foundation modification may include augmental pile support given the increased foundation loads. Lastly, further engineering study would involve additional test bores both inside and outside the building to better review and qualify the subgrade.

Options I & II will be costly but provide some assurance of a stable foundation. Option III is recommended to further review the feasibility of re-using the existing foundation. It is possible that the immediate building pad (within \approx 3-4 ft of the building perimeter) was prepared in a controlled manner. The test bores (\approx 5 ft from the foundation) suggest unstable and compressible Fill close to the foundation. It is also uncertain how the foundation pad may have been constructed in the past. In any case, there is too much uncertainty and suspect subgrade to rely on the existing foundation without inherent risk of intolerable movement.

We trust the contents of this memorandum report are responsive to your needs at this time. Should you have any questions or require additional assistance, please do not hesitate to contact our office.

Enclosures kmm50/jtc14/WorcesterDPW.rpt



TABLE 1

Emergency Safety Building 2 Coppage Drive, Worcester, MA

Recommended Soil Gradation & Compaction Specifications

Clean Granular Fill

| (Select Crus | shed Gravel Fill) |
|--------------|------------------------------|
| SIEVE SIZE | PERCENT PASSING BY WEIGHT |
| 3 inch | 100 |
| 3/4 inch | 60-90 |
| No. 4 | 20-70 |
| No. 200 | 2-8 |

NOTE:

For minimum 8-inch base below the concrete floor slab-on-grade For minimum 16-inch base for exterior concrete slabs exposed to frost For minimum 24-inch base below aprons, entrances and ramps

| SIEVE SIZE | PERCENT PASSING BY WEIGHT |
|------------|------------------------------|
| 5 inch | 100 |
| 3/4 inch | 60-100 |
| No. 4 | 20-80 |
| No. 200 | 0-10 |

Structural Fill (Gravelly SAND, little Silt)

NOTE:

For use as structural load support below the foundations For use as backfill behind unbalanced foundation/retaining walls A one-inch crushed stone should be used in wet conditions

Structural Fill placed beneath the foundation should include the *Footing Zone of Influence* which is defined as that area extending laterally one foot from the edge of the footing then outward and downward at a 1H:1V splay. Structural Fill should be placed in loose lifts not exceeding 12 inches for heavy vibratory rollers and 8 inches for vibratory plate compactors. All Structural Fill should be compacted to at least 95 percent of maximum dry density as determined by the Modified Proctor Test (ASTM-D1557). Structural Fill should be compacted within $\pm 3\%$ of optimum moisture content. The adequacy of the compaction efforts should be verified by field density testing which is also a requirement of the *Massachusetts State Building Code*.



LIMITATIONS

Explorations

- 1. The analyses, recommendations and designs submitted in this report are based in part upon the data obtained from preliminary subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.
- 2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the individual test pit and/or boring logs.
- 3. Water level readings have been made in the test pits and/or test borings under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time the measurements were made.

Review

- 4. It is recommended that this firm be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the recommendations provided herein.
- 5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by John Turner Consulting, Inc.

Construction

6. It is recommended that this firm be retained to provide geotechnical engineering services during the earthwork phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

Use of Report

- 7. This report has been prepared for the exclusive use of the City of Worcester in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.
- 8. This report has been prepared for this project by John Turner Consulting, Inc. This report was completed for preliminary design purposes and may be limited in its scope to complete an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to preliminary geotechnical design considerations.

Boring Location Plan & Boring Logs



| • _CC | NSULTIN | | | | | TEST BOR | RING LOG | j . | | |
|-----------|-----------------|----------------|-------------|------------------------------|----------------------------|-------------------------------|------------------|-----------------|-----|--|
| 1 | \checkmark | 10 | | | CLIENT: | City of Worcester-Dep | artment of Pub | olic Works | | |
| 21 | | 9 J | | 1 inc | PROJECT: | Geotechnical Evaluation | n Services | | | |
| | 0 3 | GEOTECHN | NICAL . C | CONSTRUCTION | LOCATION: | 2 Coppage Drive, Word | cester, MA | | | |
| | | | | | PROJECT No: | 14-15-00067 | | | | |
| | JOHN | TURNER | CONSUL | TING, INC. | BORING No: | B-1 | | | | |
| | | 19 DOVI | ER STRE | ET | DATE: | 9/12/2014 | | | | |
| | | DOVER | , NH 038 | 320 | LOCATION: | See Attached Plan | | | | |
| | (603) | 749-1841 | www.con | sultjtc.com | SURFACE EL: | el. 935 | | | | |
| TYPE O | F BORIN | IG: | 2 1/4" Ho | ollow Stem Augers | | GROUNDWATER OB | SERVATIONS | | | |
| DRILLIN | NG Co: | | Soil Expl | loration, Inc. | DATE: | DEPTH: | | TIME: | | |
| RIG: | | | CME 75 | ATV Rig | 9/12/2014 | 6' | | Upon Completion | | |
| DRILLE | R: | | Pat Good | lale | | | | | | |
| JTC REI | 2.: | | Judson Z | achar | | | | | | |
| | | | | | | | | | | |
| FT | NO. | SAMPLE | REC. | SOIL & ROC | K CLASSIFICATION- | DESCRIPTION | STRATUM | BLOWS | SPT | |
| | | DEPTH | (IN.) | BUR | MEISTER SYSTEM (| SOIL) | CHANGE | PER | (N) | |
| | | (FT.) | | U.S. CORPS | OF ENGINEERS SYS | TEM (ROCK) | (FT.) | 6 INCHES | | |
| 0-1 | S-1 | 0-2 | 13 | Brown, Moist, F-M SAI | ND, s. Silt, l. Gravel | (FILL) | | 2-3-5-7 | 8 | |
| 1-2 | | | | 4 | | | | | | |
| 2-3 | S-2 | 2-4 | 10 | Brown, Moist, F-M SAI | ND, s. Silt, l. Gravel | | | 10-19-10-9 | 29 | |
| 3-4 | | | | 4 | | | | | ļ | |
| 4-5 | | | | 4 | | | | | | |
| 5-6 | S-3 | 5-7 | 4 | Brown, Saturated, F-C S | SAND & Gravel, tr. Silt | | | 2-3-3-3 | 6 | |
| 6-7 | | | | | | | | | | |
| 7-8 | S-4 | 7-9 | 7 | Brown, Saturated, F-C S | SAND & Gravel, tr. Silt | | | 8-2-2-2 | 4 | |
| 8-9 | | | | - | | | 101 | | | |
| 9-10 | С. с | 10.12 | 0 | Die Dussen, Catanata d | | l Crevel | 10 | 14.9 6 17 | 14 | |
| 10-11 | 2-2 | 10-12 | 8 | DK. Brown, Saturated, C | Drganic F SAND & Silt, | I. Gravel | 11 | 14-8-0-1/ | 14 | |
| 12 13 | | | | (Cobbles @ -11) | | (SILT I SANDS) | | | | |
| 13-14 | | | | 1 | | | | | | |
| 14-15 | | | | | | | | | | |
| 15-16 | S-6 | 15-17 | 10 | Gray, Saturated, Stratifi | ed, F SAND & Silt, tr. G | ravel | | 12-16-20-28 | 36 | |
| 16-17 | | | | | | | | | | |
| 17-18 | | | | | | | | | | |
| 18-19 | | | | | | | | | | |
| 19-20 | | | | | | | | | | |
| 20-21 | S-7 | 20-22 | 13 | Gray/Brown, Saturated, | F-C SAND & Silt, s. Gr | avel | | 13-13-16-13 | 29 | |
| 21-22 | | | | | | | | | | |
| 22-23 | | | | 4 | | | | | | |
| 23-24 | | | | 4 | | | | | | |
| 24-25 | | 05.05 | 1.5 | | | C141 B241 1 D 1 | | 10.10.10.27 | | |
| 25-26 | S-8 | 25-27 | 15 | Gray/Brown, Saturated, | F-C SAND, s. Gravel, l. | Siit,I. Wthrd Rock | | 10-13-18-27 | 31 | |
| 20-27 | | | | boring Terminated @ | -21 | | | | | |
| 21-28 | | | | 1 | | | | | | |
| 29-30 | | | | 1 | | | | | | |
| 30-31 | | | | 1 | | | | | | |
| 31-32 | | | | 1 | | | | | | |
| REMAR | KS: | | | | | | 1 | | | |
| | | | | | | | | | | |
| Standard | l Penetra | tion Tests (| SPT) = 14 | 40# hammer falling 30 | " (ASTM D1586) | | | | | |
| Blows an | re per 6 i | nches with | a 24" long | g by 2" O.D. by 1 3/8" | I.D. split spoon samp | ler unless otherwise note | d | | | |
| S = split | -spoon s | ample; C = | rock core | sample; U = undisturb | bed | | | | | |
| REMARI | KS: The | stratification | lines repre | esent the approximate bot | undary between soil type. | s and the transition may be | gradual. Water | | | |
| | level | readings hav | e been maa | de in the test borings at ti | mes and under condition | s stated in the test boring l | ogs. Fluctuation | S | | |
| | in the | e level of the | groundwate | er may occur due to othe | r factors than those prese | ent at the time measuremen | ts were made. | | | |
| | Prop | ortions used: | trace (0-1 | 0%), little (10-20%), so | me (20-35%), and (35-3 | 50%) | | | | |

| • CC | NSULTIN | | | | | TEST BOR | RING LOG | | | | |
|-----------|------------|----------------|-------------|------------------------------|----------------------------|-------------------------------------|------------------|-----------------|-----|--|--|
| | | 10° | 4 | | CLIENT: | City of Worcester-Dep | artment of Pub | olic Works | | | |
| 50 | | Ş | | | PROJECT: | Geotechnical Evaluatio | n Services | | | | |
| | 10 3 | GEOTECHN | MICAL | INC. | LOCATION | 2 Coppage Drive Word | rester MA | | | | |
| | | GLOTLETI | NICAL • C | CONSTRUCTION | PROJECT No: | 14-15-00067 | | | | | |
| | JOHN | TURNER | CONSUI | TING. INC. | BORING No: | B-2 | | | | | |
| | | 19 DOVI | ER STRE | ET | DATE: | 9/12/2014 | | | | | |
| | | DOVER | , NH 03 | 820 | LOCATION: | See Attached Plan | | | | | |
| | (603) | 749-1841 | www.con | sultjtc.com | SURFACE EL: | el. 935 | | | | | |
| TYPE O | F BORIN | NG: | 2 1/4" H | ollow Stem Augers | | GROUNDWATER OBSERVATIONS | | | | | |
| DRILLI | NG Co: | | Soil Exp | loration, Inc. | DATE: | DEPTH: | | TIME: | | | |
| RIG: | | | CME 75 | ATV Rig | 9/12/2014 | 8' | | Upon Completion | | | |
| DRILLE | R: | | Pat Good | lale | | | | | | | |
| JTC REI | P.: | | Judson Z | | | | | | | | |
| | | | | | | | | | | | |
| FT | NO. | SAMPLE | REC. | SOIL & ROC | K CLASSIFICATION- | DESCRIPTION | STRATUM | BLOWS | SPT | | |
| | | DEPTH | (IN.) | BUF | MEISTER SYSTEM (| SOIL) | CHANGE | PER | (N) | | |
| | | (FT.) | | U.S. CORPS | OF ENGINEERS SYS | TEM (ROCK) | (FT.) | 6 INCHES | | | |
| 0-1 | S-1 | 0-2 | 4 | 2" Loamy Topsoil | | (TOPSOIL) | 2" | 2-10-8-9 | 18 | | |
| 1-2 | | | | | | (FILL) | | | | | |
| 2-3 | S-2 | 2-4 | 6 | Brown, Moist, F-M SAI | ND, s. Silt, l. Gravel | | | 5-5-5-5 | 10 | | |
| 3-4 | | | | | | | | | | | |
| 4-5 | | | | | | | 6' | | | | |
| 5-6 | S-3 | 5-7 | 16 | Dk. Brown, V. Moist, C | Organic F SAND & Silt, l | . Wood Chips | | 5-4-6-8 | 10 | | |
| 6-7 | | | | | | (ORGANICS) | 7'6" | | | | |
| 7-8 | S-4 | 7-9 | 17 | Gray, Saturated, SILT, | s. Gravel, s. Sand | (SANDY SILTS) | | 22-17-24-32 | 41 | | |
| 8-9 | | | | (Cobbles @ -8') | | | | | | | |
| 9-10 | a 5 | 10.10 | 0 | _ | | | | | 10 | | |
| 10-11 | 5-5 | 10-12 | 0 | - | | | | 8-6-6-6 | 12 | | |
| 12 13 | | | | | | | | | | | |
| 12-13 | | | | - | | | | | | | |
| 14-15 | | | | - | | | | | | | |
| 15-16 | S-6 | 15-17 | 13 | Gray/Brown, Saturated, | SILT & F Sand, l. Grave | el | | 6-8-10-10 | 18 | | |
| 16-17 | | | | | | | | | | | |
| 17-18 | | | | | | | | | | | |
| 18-19 | | | | | | | | | | | |
| 19-20 | | | | | | | | | | | |
| 20-21 | S-7 | 20-22 | 17 | Brown, Saturated, SILT | & F-M Sand, s. Gravel | | | 23-21-35-35 | 56 | | |
| 21-22 | | | | | | | | | | | |
| 22-23 | | | | - | | | | | ├ | | |
| 23-24 | 1 | | | - | | | | | | | |
| 24-25 | C O | 25.27 | 14 | Brown Saturated STIT | & FM Sand a Crow-1 | | | 10 18 21 22 | 20 | | |
| 25-20 | 5-8 | 23-21 | 14 | Boring Terminated | -27' | | | 10-10-21-22 | 39 | | |
| 27-28 | | | | boring rerninated @ | | | | | | | |
| 28-29 | | | | 1 | | | | | | | |
| 29-30 | | | | 1 | | | | | | | |
| 30-31 | | | | | | | | | | | |
| 31-32 | | | | 1 | | | | | | | |
| REMAR | KS: | | | | | | | | | | |
| | | | | | | | | | | | |
| Standard | l Penetra | tion Tests (| SPT) = 1 | 40# hammer falling 30 | " (ASTM D1586) | | | | | | |
| Blows an | re per 6 i | inches with | a 24" long | g by 2" O.D. by 1 3/8" | I.D. split spoon samp | ler unless otherwise note | d | | | | |
| S = split | -spoon s | ample; C = | rock core | sample; U = undisturt | bed | | | | | | |
| REMARI | KS: The | stratification | lines repre | esent the approximate bo | undary between soil type | s and the transition may be | gradual. Water | | | | |
| | level | readings hav | e been ma | de in the test borings at ti | mes and under condition | as stated in the test boring l | ogs. Fluctuation | S | | | |
| | in the | e level of the | groundwat | er may occur due to othe | r factors than those prese | ent at the time measuremen. 50%) | ts were made. | | | | |

| • _CC | NSULTIN | | | | | TEST BOP | RING LOG | ì | | | |
|-----------|---|------------------|-------------|------------------------------|----------------------------|--------------------------------|------------------|-----------------|-----|--|--|
| 1 | \checkmark | io. | | | CLIENT: | City of Worcester-Depa | artment of Pub | lic Works | | | |
| 21 | | Ĩ. | | J inc. | PROJECT: | Geotechnical Evaluatio | n Services | | | | |
| | 018 | GEOTECHN | NICAL . C | ONSTRUCTION | LOCATION: | 2 Coppage Drive, Word | cester, MA | | | | |
| | | | | | PROJECT No: | 14-15-00067 | | | | | |
| | JOHN | TURNER | CONSUL | TING, INC. | BORING No: | B-3 | | | | | |
| | | 19 DOVE | ER STRE | ET | DATE: | 9/12/2014 | | | | | |
| | | DOVER | , NH 038 | 320 | LOCATION: | See Attached Plan | | | | | |
| | (603) | 749-1841 | www.con | sultjtc.com | SURFACE EL: | el. 935 | | | | | |
| TYPE O | F BORIN | iG: | 2 1/4" Ho | ollow Stem Augers | | GROUNDWATER OBS | SERVATIONS | | | | |
| DRILLI | NG Co: | | Soil Expl | oration, Inc. | DATE: | DEPTH: | | TIME: | | | |
| RIG: | | | CME 75 | ATV Rig | 9/12/2014 | 8' | | Upon Completion | | | |
| DRILLE | R: | | Pat Good | ale | | | | | | | |
| JTC REI | ?.: | | Judson Z | achar | | | | | | | |
| | | | | | | | | | | | |
| FT | NO. | SAMPLE | REC. | SOIL & ROC | K CLASSIFICATION- | DESCRIPTION | STRATUM | BLOWS | SPT | | |
| | | DEPTH | (IN.) | BUR | MEISTER SYSTEM (| SOIL) | CHANGE | PER | (N) | | |
| | | (FT .) | | U.S. CORPS | OF ENGINEERS SYS | TEM (ROCK) | (FT.) | 6 INCHES | | | |
| 0-1 | S-1 | 0-2 | 15 | 2" Loamy Topsoil | | | 2" | 3-13-7-3 | 20 | | |
| 1-2 | | | | | | (FILL) | | | | | |
| 2-3 | S-2 | 2-4 | 7 | Brown, Moist, F-M SAI | ND, s. Silt, l. Gravel | . , | | 4-6-8-12 | 14 | | |
| 3-4 | | | |] | | | | | | | |
| 4-5 | | | | | | | 5' | | | | |
| 5-6 | S-3 | 5-7 | 17 | Brown, Saturated, SILT | & F-M Sand, s. Gravel | | | 7-9-9-8 | 18 | | |
| 6-7 | | | | | | (SILT/SANDS) | | | | | |
| 7-8 | S-4 | 7-9 | 15 | Brown, Saturated, SILT | & F-M Sand, s. Gravel | | | 10-10-10-12 | 20 | | |
| 8-9 | | | | (Lense of Rust/Brown S | and) | | | | | | |
| 9-10 | | | | | | | | | | | |
| 10-11 | S-5 | 10-12 | 8 | Brown, Saturated, SILT | & F-M Sand, s. Gravel | | | 77-48-10-11 | 58 | | |
| 11-12 | | | | (Lense of Rust/Brown S | and) | | | | | | |
| 12-13 | | | | | | | | | | | |
| 13-14 | | | | - | | | | | | | |
| 14-15 | | | | - | | | | | | | |
| 15-16 | S-6 | 15-17 | 21 | Brown, Saturated, SILT | & F-M Sand, s. Gravel | | | 13-24-30-32 | 64 | | |
| 16-17 | | | | (Lense of Rust/Brown S | and) | | | | | | |
| 17-18 | | | | - | | | | | | | |
| 18-19 | | | | | | | | | | | |
| 19-20 | 0.7 | 20.22 | 16 | | | , | | 14 02 05 00 | 40 | | |
| 20-21 | 5-7 | 20-22 | 16 | Brown/Gray, Saturated, | SIL1 & F-M Sand, s. Gr | avei | | 14-23-25-28 | 48 | | |
| 21-22 | | | | - | | | | | | | |
| 22-23 | | | | - | | | | | | | |
| 23-24 | | | | Auger Refusel @ _24'4 | | | | | | | |
| 25-26 | | | | Boring Terminated @ | -24'6'' | | ┝───┤ | | | | |
| 26-27 | | | | zoring rerinnated @ | | | | | | | |
| 27-28 | | | | 1 | | | | | | | |
| 28-29 | | | | 1 | | | | | | | |
| 29-30 | | | | 1 | | | | | | | |
| 30-31 | | | | 1 | | | | | | | |
| 31-32 | | | |] | | | | | | | |
| REMAR | KS: | | | - | | | | | - | | |
| | | | | | | | | | | | |
| Standard | l Penetra | tion Tests (| SPT) = 14 | 40# hammer falling 30 | " (ASTM D1586) | | | | | | |
| Blows an | e per 6 i | nches with | a 24" long | g by 2" O.D. by 1 3/8" | I.D. split spoon samp | ler unless otherwise note | d | | | | |
| S = split | s = split-spoon sample; C = rock core sample; U = undisturbed | | | | | | | | | | |
| REMARI | KS: The | stratification | lines repre | sent the approximate bo | undary between soil type. | s and the transition may be | gradual. Water | | | | |
| | level | readings hav | e been maa | le in the test borings at ti | mes and under condition | s stated in the test boring la | ogs. Fluctuation | \$ | | | |
| | in the | e level of the g | groundwate | er may occur due to othe | r factors than those prese | ent at the time measurement | s were made. | | | | |
| | Prop | ortions used: | trace (0-1 | 0%), little (10-20%), so | me (20-35%), and (35-5 | 50%) | | | | | |

| • _ CC | ONSULTIN | | | | | TEST BOR | RING LOG | | | |
|-----------------------|--------------|----------------|-------------------------|--|---------------------------|---|--------------------|-----------------|-----|--|
| | \checkmark | 10 I | | | CLIENT: | City of Worcester-Dep | artment of Pub | lic Works | | |
| S. | | 9 N | | | PROJECT: | Geotechnical Evaluation | n Services | | | |
| | 10 3 | GEOTECHN | VICAL • C | ONSTRUCTION | LOCATION: | 2 Coppage Drive, Word | cester. MA | | | |
| | | ologitadin | | | PROJECT No: | 14-15-00067 | , | | | |
| | JOHN | TURNER | CONSUL | TING, INC. | BORING No: | B-4 | | | | |
| | | 19 DOVI | ER STRE | ET | DATE: | 9/12/2014 | | | | |
| | | DOVER | , NH 038 | 320 | LOCATION: | See Attached Plan | | | | |
| | (603) | 749-1841 | www.con | sultjtc.com | SURFACE EL: | el. 935 | | | | |
| TYPE O | F BORIN | IG: | 2 1/4" Ho | ollow Stem Augers | | GROUNDWATER OB | SERVATIONS | | | |
| DRILLI | NG Co: | | Soil Expl | oration, Inc. | DATE: | DEPTH: | TIME: | | | |
| RIG: | | | CME 75 | ATV Rig | 9/12/2014 | 5'6'' | | Upon Completion | | |
| DRILLE | R: | | Pat Good | ale | | | | | | |
| JTC RE | P.: | | Judson Z | | | | | | | |
| | | | | | | | | | | |
| FT | NO. | SAMPLE | REC. | SOIL & ROC | K CLASSIFICATION- | DESCRIPTION | STRATUM | BLOWS | SPT | |
| | | DEPTH | (IN.) | BUF | RMEISTER SYSTEM (| SOIL) | CHANGE | PER | (N) | |
| | | (FT.) | | U.S. CORPS | OF ENGINEERS SYS | TEM (ROCK) | (FT.) | 6 INCHES | | |
| 0-1 | S-1 | 0-2 | 4 | 2" Loamy Topsoil | | | 2" | 5-16-10-11 | 26 | |
| 1-2 | | | | | | (FILL) | | | | |
| 2-3 | S-2 | 2-4 | 6 | Brown, Moist, F-M SA | ND, s. Silt, s. Gravel | | | 3-3-8-8 | 11 | |
| 3-4 | | | | | | | 4' | | | |
| 4-5 | | | | 4 | | (ORGANICS) | | | | |
| 5-6 | S-3 | 5-7 | 10 | Dk. Brown, Saturated, | Organic SAND, s. Silt, tr | Gravel | 6' | 8-22-20-25 | 42 | |
| 6-7 | | | | | | (SILTS/SANDS) | | | | |
| 7-8 | S- 4 | 7-9 | 5 | Brown, Saturated, F-M | SAND & Silt, s. Gravel | | | 16-27-34-27 | 61 | |
| 8-9 | | | | | | | | | | |
| 9-10 | S-5 | 10-12 | 12 | Brown Saturated SILT | & Sand & Gravel | | | 10-17-15-15 | 32 | |
| 11-12 | 5-5 | 10-12 | 12 | brown, Saturated, SiL1 | de Band, 3. Graver | | | 10-17-13-15 | 52 | |
| 12-13 | | | | | | | | | | |
| 13-14 | | | | 1 | | | | | | |
| 14-15 | | | | | | | | | | |
| 15-16 | S-6 | 15-17 | 16 | Brown, Saturated, SILT | & Sand, s. Gravel | | | 7-14-26-27 | 40 | |
| 16-17 | | | | | | | | | | |
| 17-18 | | | | - | | | | | | |
| 18-19 | | | | 4 | | | | | | |
| 19-20 | | | | | ~ | | | | | |
| 20-21 | | | | Auger Refusal @ -1978 | 101911 | | | | | |
| 21-22 | | | | boring rerminated @ | -17 0 | | | | | |
| 22-23 | | | | 1 | | | ├ | | | |
| 24-25 | | | | 1 | | | + | | | |
| 25-26 | | | | 1 | | | | | | |
| 26-27 | | | | 1 | | | | | | |
| 27-28 | | | |] | | | | | | |
| 28-29 | | | |] | | | | | | |
| 29-30 | | | | 1 | | | | | | |
| 30-31 | | | | 4 | | | $ \square$ | | | |
| 31-32 | | | | | | | | | | |
| REMAR | KS: | | | | | | | | | |
| a | 1.5 | | | | | | | | | |
| Standard | 1 Penetra | tion Tests (| SPT) = 14 | 10# hammer falling 30 |)" (ASTM D1586) | 1 1 4 1 | 1 | | | |
| Blows at $S = c^{-1}$ | re per 6 i | inches with | a 24" long | g by 2^{-1} O.D. by $1.3/8^{-1}$ | I.D. split spoon samp | other unless otherwise note | D | | | |
| S = split | -spoon s | ample; C = | IOCK CORE | sample; $U = undisturb$ | Jed | 7.7 | 1 1 *** | | | |
| KEMARI | KS: The | stratification | unes repre | esent the approximate boo | unaary between soil type | es and the transition may be | gradual. Water | | | |
| | in the | readings hav | e veen maa aroundwat | ie in ine test borings at fi er may occur due to othe | r factors than those prov | is sitiled in the test boring li ent at the time measurement | rgs. r incluations | • | | |
| | Prop | ortions used: | trace (0-1 | 0%), little (10-20%), so | ome (20-35%), and (35- | 50%) | is were muue. | | | |

| • CC | ONSULTIN | G·T | | \mathbf{O} | | TEST P | IT LOG | |
|--------|----------|----------------|---------------|-----------------------------|--------------------------|-------------------------------|--------------------------|--|
| | | 10th | | | CLIENT: | City of Worcester - De | partment of Public Works | |
| 5 | | 5 | | | PROJECT: | Geotechnical Evaluatio | Services | |
| | 10 10 | GEOTECHN | NICAL • CO | INC. | LOCATION: | 2 Coppage Drive, Word | cester. MA | |
| | | | | | PROJECT No: | 14-15-00067 | , | |
| | JOHN | TURNER | CONSUL | FING, INC. | TEST PIT #: | TP-4 | | |
| | | 19 DOV | ER STREF | ET | DATE: | 9/30/2014 | | |
| | | DOVE | R, NH 0382 | 20 | LOCATION: | See Attached Plan | | |
| | (603) | 749-1841 | www.cons | ultjtc.com | SURFACE EL: | 935 | | |
| EQUIPN | 1ENT US | ED: | John Deere | Backhoe | | GROUNDWATER OBS | SERVATIONS | |
| EXCAV | ATION (| : 0: | DPW | | DATE: | DEPTH: | TIME: | |
| JTC RE | P: | | Judson Zac | char | 9/30/2014 | 7' | 3-Hrs After Completion | |
| | | | | | | | Ľ. | |
| | | | | | | | | |
| | | | | | | | | |
| FT | NO. | SAMPLE | Excavator | SOIL & ROCH | K CLASSIFICATION | DESCRIPTION | STRATUM | |
| | | DEPTH | Effort | BUR | MEISTER SYSTEM | SOIL) | CHANGE | |
| | | (FT.) | | U.S. CORPS | OF ENGINEERS SYS | TEM (ROCK) | (FT.) | |
| 0 | | . , | М | Lt Brown Moist F-C S | AND s Gravel & Cob | les s Silt | | |
| | | | | | | (FILL) | | |
| | | | | | | (1111) | | |
| 1 | | | | | | | | |
| | | | | | | | | |
| | | | | 1 | | | | |
| 2 | | | | | | | | |
| | | | | 1 | | | | |
| | | | | 1 | | | | |
| 3 | | | | 1 | | | | |
| | | | | Top of Footing (-3'6'') | | | 3.5' | |
| | | | | (Footing Extended 12'' | Laterally from Found | tion Wall.) | | |
| 4 | | | | 1 | | | | |
| | | | | Bottom of Footing (-4'd | 5'') | | | |
| | | | M/D | Dk. Brown, Moist, F-C | SAND & GRAVEL/CO | BBLES, l. silt | | |
| 5 | | | | | | (FILL) | | |
| | | | | | | | | |
| | | | | | | | | |
| 6 | | | | | | | | |
| | | | | | | | | |
| | | | | - | | | | |
| 7 | | | | 4 | | | | |
| | | | | 4 | | | | |
| _ | | | | 4 | | | | |
| 8 | | | | 4 | | | | |
| | | | | 4 | | | | |
| 0 | | | | 4 | | | | |
| 9 | | | | 4 | | | | |
| | | | | Test Pit Terminated @ | -0'4" due to weter or | ading Test | | |
| 10 | | | | Pit walls | -> - uue to water er | ning 105t | | |
| 10 | | | | 1 IC 17 4115. | | | | |
| REMAR | KS: | Excavator F | ffort Abbrevi | ations: E=Easy M=Mode | erate D=Difficult | | I | |
| | | | | | | | | |
| REMAR | KS: The | stratification | lines represe | ent the approximate bound | darv between soil types | and the transition may be or | radual. Water | |
| | level | readings hav | e been made | in the test borings at time | es and under conditions | stated in the test horing log | s. Fluctuations | |
| | in the | e level of the | groundwater | may occur due to other fi | actors than those preser | t at the time measurements | were made. | |
| | Prop | ortions used: | trace (0-10% | %), little (10-20%), som | e (20-35%), and (35-50 | 9%) | | |

| • • • | ONSULTIN | | | \cap | TEST PIT LOG | | | | |
|---|--|----------------|--|---|--------------------------|--|------------------------|--|--|
| - A | \searrow | NO. | 410.05 | | CLIENT: | VT: City of Worcester - Department of Public Works | | | |
| 0 | | 9 J | - - | J inc. | PROJECT: | Geotechnical Evaluatio Services | | | |
| | 013 | GEOTECHN | NICAL • CO | NSTRUCTION | LOCATION: | 2 Coppage Drive, Worcester, MA | | | |
| | | | | | PROJECT No: | 14-15-00067 | | | |
| | JOHN | TURNER | CONSUL | FING, INC. | TEST PIT #: | TP-5 | | | |
| | | 19 DOV | ER STREI | ET | DATE: | 9/30/2014 | | | |
| | | DOVE | R, NH 0382 | 20 | LOCATION: | See Attached Plan | | | |
| | (603) | 749-1841 | www.cons | ultjtc.com | SURFACE EL: | 935 | | | |
| EOUIPM | AENT US | ED: | John Deere | Backhoe | GROUNDWATER OBSERVATIONS | | | | |
| EXCAV | ATION C | :0: | DPW | | DATE: | DEPTH: | TIME: | | |
| ITC RE | р. | | Judson Zac | har | 9/30/2014 | 7'6'' | 2.Hrs After Completion | | |
| JIC KE | | | Juuson Zac | inar | <i>)/30/201</i> 4 | 70 | 2-ms Atter Completion | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | Г <u> — </u> | | | | | | |
| FT | NO. | SAMPLE | Excavator | SOIL & ROCI | K CLASSIFICATION | -DESCRIPTION | STRATUM | | |
| | DEPTH Effort BUR | | | MEISTER SYSTEM | (SUIL) | CHANGE | | | |
| | | (F°T.) | | U.S. CORPS | OF ENGINEERS SYS | STEM (ROCK) | (FT.) | | |
| 0 | | | М | Lt. Brown, Moist, F-C S | AND, s. Gravel & Cob | bles, s. Silt | | | |
| | | | | | | (FILL) | | | |
| | | | | | | | | | |
| 1 | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 2 | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 3 | | | | | | | | | |
| | | | | Top of Footing (-3'6") | | | 3.5' | | |
| | | | | (Footing Extended 12'' Laterally from Foundation Wall.) | | | | | |
| 4 | | | | | | | | | |
| | | | | Bottom of Footing (-4'd | <u>5'')</u> | | | | |
| | | | M/D | Dk. Brown, Moist, F-C | SAND & GRAVEL/CO | BBLES, l. silt | | | |
| 5 | | | | | | (FILL) | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 6 | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 7 | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 8 | | | | | | | | | |
| | | | | Test Pit Terminated @ | -8' once soil was dete | mined to not | | | |
| | | | | have Organic properti | es. | | | | |
| 9 | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 10 | | | | | | | | | |
| | | | | | | | | | |
| REMARKS: Excavator Effort Abbreviations: E=Easy, M=Moderate, D=Difficult | | | | | | | | | |
| | | | | | | | | | |
| REMARKS: The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water | | | | | | | | | |
| | level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations | | | | | | | | |
| | in the | e level of the | groundwater | may occur due to other f | actors than those preser | nt at the time measurements | were made. | | |
| Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%) | | | | | | | | | |

| • C(| ONSULTIN | G · T | | \bigcirc | TEST PIT LOG | | | | |
|---|--|------------|------------|--|--|---------------------------------------|------------------------|--|--|
| | | 10° | | | CLIENT: City of Worcester - Department of Public Works | | | | |
| S. | | 5 | | | PROJECT: | Geotechnical Evaluatio Services | | | |
| | 10 3 | GEOTECHN | NICAL • CO | NSTRUCTION | LOCATION: | 2 Coppage Drive, Worcester, MA | | | |
| | | | | | PROJECT No: | 14-15-00067 | | | |
| | JOHN | TURNER | CONSUL | FING. INC. | TEST PIT #: | TP-6 | | | |
| | | 19 DOV | ER STREI | ET | DATE: | 9/30/2014 | | | |
| | | DOVE | R, NH 0382 | 20 | LOCATION: | See Attached Plan | | | |
| | (603) | 749-1841 | www.cons | ultjtc.com | SURFACE EL: | 935 | | | |
| EQUIPN | MENT US | ED: | John Deere | Backhoe | | GROUNDWATER OBSERVATIONS | | | |
| EXCAV | ATION (| CO: | DPW | | DATE: | DEPTH: | TIME: | | |
| JTC RE | P: | | Judson Zac | har | 9/30/2014 | 7'0'' | 2-Hrs After Completion | | |
| | | | | | | | - | | |
| | | | | | | | | | |
| | | | | | | | | | |
| FT | NO. | SAMPLE | Excavator | SOIL & ROCH | K CLASSIFICATION | -DESCRIPTION | STRATUM | | |
| | | DEPTH | Effort | BUR | MEISTER SYSTEM | (SOIL) | CHANGE | | |
| | (FT.) U.S. CORPS | | | OF ENGINEERS SYS | STEM (ROCK) | (FT.) | | | |
| 0 | | | М | Lt. Brown, Moist, F-C S | AND, s. Gravel & Cob | bles, s. Silt | | | |
| - | | | | , , , | , | (FILL) | | | |
| | | | | | | · · · · · · · · · · · · · · · · · · · | | | |
| 1 | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 2 | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 3 | | | | | | | | | |
| | | | | Top of Footing (-3'6'') | | | 3.5' | | |
| | | | | (Footing Extended 36" | Laterally from Found | | | | |
| 4 | | | | | | | | | |
| | | | | | | | | | |
| | | | M/D | Bottom of Footing (-4't | 5'') | | | | |
| 5 | | | | Dk. Brown, Moist, F-C SAND & GRAVEL/COBBLES, l. silt | | | | | |
| | | | | - | | (FILL) | | | |
| | | | | | | | | | |
| 6 | | | | | | | | | |
| | | | | - | | | | | |
| 7 | | | | | | | | | |
| / | | | | | | | | | |
| | | | | | | | | | |
| 8 | | | | | | | | | |
| | | | | | | | | | |
| | 1 | | | Test Pit Terminated @ | -8'6" once soil was do | etemined to | | | |
| 9 | | | | not have Organic prop | erties. | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 10 | | | | | | | | | |
| | | | | | | | | | |
| REMAR | REMARKS: Excavator Effort Abbreviations: E=Easy, M=Moderate, D=Difficult | | | | | | | | |
| | | | | | | | | | |
| REMARKS: The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water | | | | | | | | | |
| | level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations | | | | | | | | |
| | in the level of the groundwater may occur due to other factors than those present at the time measurements were made. | | | | | | | | |
| | Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%) | | | | | | | | |

| • CC | NSULTIN | G·T | | \mathbf{O} | TEST PIT LOG | | | |
|--|---|-------------|--------------|-------------------------|---------------------------|--|---------------------------------------|--|
| | | 10th | | | CLIENT: | City of Worcester - Department of Public Works | | |
| 5 | | 5 | | | PROJECT: | Geotechnical Evaluatio Services | | |
| | 10 3 | GEOTIECHN | VICAL • COI | INC. | LOCATION: | 2 Coppage Drive Worcester MA | | |
| | | OLO I LOIN | | | PROJECT No: | 14-15-00067 | · · · · · · · · · · · · · · · · · · · | |
| | JOHN | TURNER | CONSUL | TING, INC. | TEST PIT #: | TP-7 | | |
| | | 19 DOV | ER STREF | ET | DATE: | 9/30/2014 | | |
| | | DOVE | R. NH 0382 | 20 | LOCATION: | See Attached Plan | | |
| | (603) | 749-1841 | www.cons | ultitc.com | SURFACE EL: | 934 | | |
| EOUIPM | IENT US | ED: | John Deere | Backhoe | GROUNDWATER OBSERVATIONS | | | |
| EXCAV | ATION C | CO: | DPW | | DATE: | DEPTH: | TIME: | |
| JTC RE | P: | | Judson Zac | har | 9/30/2014 | None Encountered | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| FT | NO | SAMPLE | Excavator | SOIL & ROCK | CLASSIFICATION- | DESCRIPTION | STRATIM | |
| | 110. | рертн | Effort | RID | MEISTER SVSTEM | SOIL) | CHANGE | |
| | | (FT) | LIIOIt | US CORPS | OF ENGINEERS SYS | TEM (ROCK) | (FT) | |
| 0 | | (11) | EM | Dk Prown Moist E C S | AND a Gravel 1 Silt | | | |
| 0 | | | L/1VI | DA.DIUWII, MUISI, F-C S | navel, s. Olavel, I. Sill | (ЕПТ) | | |
| | | | | | | (FILL) | | |
| 1 | | | | | | | | |
| 1 | | | | | | | 1.5' | |
| | | | M/D | Dk Grav/Brown F-M S | AND & Silt & Gravel t | r Organics | 1.5 | |
| 2 | | | NI/D | DR. Gluy/Diown, I 1415 | nind a bin, s. chavel, t | (SANDS/SILTS) | | |
| | | | | | | (6/11(106/511115) | | |
| | | | | | | | | |
| 3 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| 4 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| 5 | | | | | | | | |
| | | | D | | | | | |
| | | | | | | | | |
| 6 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| 7 | | | | | | | | |
| | | | | | | | | |
| | | | | Test Pit Terminated @ | -7'6''. | | | |
| 8 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| 9 | | | | | | | | |
| | | | | | | | | |
| 10 | | | | | | | | |
| 10 | | | | | | | | |
| DEMAD | vs. | Evonyator E | ffort Abbra- | ations: E=Easy M=M-1 | proto D-Difficult | | | |
| ALIVIANAS, EACAVAIOI EITOIT AUDICVIATIONS, E-EASY, IVI-IVIOUETATE, D=DITTICUIT | | | | | | | | |
| REMARKS . The stratification lines represent the approximate boundary between soil types and the transition may be availed. Water | | | | | | | | |
| level readings have been made in the test borings at times and under conditions stated in the test boring loss. Eluctuations | | | | | | | | |
| in the level of the groundwater may occur due to other factors than those present at the time measurements were made | | | | | | | | |
| | Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%) | | | | | | | |

Soil Laboratory Reports




REPORT OF ORGANIC CONTENT

Sampled Source: B-1(S-5) 10'-12' Soil ID #: 14-1072 Date Received: 9-15-14 Method of Test: ASTM D2974

Sampled By: Judson Zachar **Tested By: Jeff Young**

Moisture Content 21.6%

Organic Content 3.8%

> Ash Content 96.2%

JOHN TURNER CONSULTING NH MA ME VT **CONSULTJTC.COM**

19 DOVER STREET DOVER, NH 03820 T 603.749.1841 F 603.516.6851 T 508-505-0126

66 SOUTHGATE STREET WORCESTER MA 01607 6 CLINTON AVENUE WESTFIELD MA 01085 T 413.642.0138 F 413.642.0164

585 RIVERSIDE STREET, #73 PORTLAND ME 04103 T 207.883.7878





REPORT OF ORGANIC CONTENT

Sampled Source: B-4(S-3) 5'-7' Soil ID #: 14-1077 Date Received: 9-15-14 Method of Test: ASTM D2974

Sampled By: Judson Zachar **Tested By: Jeff Young**

Moisture Content 24.3%

Organic Content 3.7%

> Ash Content 96.3%

JOHN TURNER CONSULTING NH MA ME VT **CONSULTJTC.COM**

19 DOVER STREET DOVER, NH 03820 T 603.749.1841 F 603.516.6851 T 508-505-0126

66 SOUTHGATE STREET WORCESTER MA 01607 6 CLINTON AVENUE WESTFIELD MA 01085 T 413.642.0138 F 413.642.0164

585 RIVERSIDE STREET, #73 PORTLAND ME 04103 T 207.883.7878









Site Photographs



SITE PHOTOGRAPHS EMERGENCY SAFETY BUILDING 2 COPPAGE DRIVE, WORCESTER, MA









Northeast Corner (interior)



Northeast Corner (exterior)





TP-4



TP-6



TP-5



TP-7



ASTM F2170 RAPID RH TEST RESULTS

| CLIENT: | City of Worcester, MA | PROJECT: | 2 Coppage Drive |
|---------|------------------------------|-----------------|------------------|
| | Department of Public Works | | Worcester, MA |
| | 50 Skyline Drive | | |
| | Worcester, MA 01605 | | |
| | Attn: Mr. Christopher Adcock | | |
| DATE. | Sontombor 3 2014 | рерорт #• | 17 10 000117 002 |

| DATE: | September 3, 2014 | REPORT #: | 14-10-000114-002 |
|-------------------------|----------------------------|-------------------------------|------------------|
| General Location | : Offices / Lunch Room/ Sm | all Bay / Large Bay / Wash Ro | om/ Corridor |
| Date Placed: | 09/03/14 | | |
| Field Rep: | Dave Grodan | | |
| Contractor: | | | |

| Sensor Number | Location | Depth | Date/Time Installed | Date/TimeDate ReadDate RInstalled% RH/°F% RH | |
|------------------|-----------------------------------|-------|-----------------------------|--|--------------|
| S593740 | Room # 1 | 2" | Date 09-03-14 Time 12:00 | Date 09-06-14 98 % 74 °F | Date % °F |
| S593852 | Room # 2 | 2" | Date 09-03-14 Time 12:10 | Date 09-06-14 H: % 71 °F | Date % °F |
| S594262 | BAJH Room | 2" | Date 09-03-14 Time 12:20 | Date 09-06-14 H: % 71 °F | Date % °F |
| \$593531 | Room # 4 | 2" | Date 09-03-14 Time 12:30 | Date 09-06-14 97 % 70 °F | Date % °F |
| S594159 | Lunch Room / Under Window | 2" | Date 09-03-14 Time 12:45 | Date 09-06-14 95 % 74 °F | Date % °F |
| S594163 | Lunch Room / Right Rear Corner | 2" | Date 09-03-14 Time 1:00 | Date 09-06-14 99 % 71 °F | Date % °F |
| S594010 | Room # 7 | 2" | Date 09-03-14 Time 1:30 | Date 09-06-14 H: % 71 °F | Date % °F |
| \$593526 | Room # 8 | 2" | Date 09-03-14 Time 1:45 | Date 09-06-14 H: % 71 °F | Date % °F |
| S593846 | Small Bay # 9 | 2" | Date 09-03-14 Time 2:00 | Date 09-06-14 99 % 71 °F | Date % °F |

* All locations from existing floor plan

NH MA ME CT VT RI

JOHN TURNER CONSULTING

CONSULTJTC.COM

6 CLINTON AVENUE WESTFIELD MA 01085 T 413.642.0138 4775 ROUTE 14, UNIT 3 WRJ, VT 05001 T 603.234.0850 73 RAINMAKER DRIVE PORTLAND ME 04103-1291 T 207.883.7878



ASTM F2170 RAPID RH TEST RESULTS

| CLIENT: | City of Worcester, MA Department of Public Works 50 Skyline Drive Worcester, MA 01605 Attn: Mr. Christopher Adcock | PROJECT: | 2 Coppage Drive Worcester, MA | |
|---------|--|------------------|----------------------------------|--|
| DATE: | September 3, 2014 | REPORT #: | 14-10-000114-002 | |

| DATE: | September 3, 2014 | REPORT #: | 14-10-000114-002 |
|-----------------------|-------------------------------|-------------------------------|------------------|
| General Locati | on: Offices / Lunch Room/ Sma | ull Bay / Large Bay / Wash Ro | om/ Corridor |
| Date Placed: | 09/03/14 | | |
| Field Rep: | Dave Grodan | | |
| Contractor: | | | |

| Sensor Number | Location | Depth | Date/TimeDate ReadInstalled% RH/°F | | Date Read % RH/°F |
|------------------|----------------|-------|------------------------------------|----------------------------|----------------------|
| S594231 | Small Bay # 10 | 2" | Date 09-03-14 Time 2:30 | Date 09-06-14 98 % 71 °F | Date % °F |
| S594117 | Large Bay # 11 | 2" | Date 09-03-14 Time 2:45 | Date 09-06-14 H: % 72 °F | Date % °F |
| \$593495 | Large Bay # 12 | 2" | Date 09-03-14 Time 3:15 | Date 09-06-14 H: % 72 °F | Date % °F |
| \$593950 | Large Bay # 13 | 2" | Date 09-03-14 Time 3:30 | Date 09-06-14 H: % 72 °F | Date % °F |
| S593988 | Large Bay # 14 | 2" | Date 09-03-14 Time 3:45 | Date 09-06-14 H: % 72 °F | Date % °F |
| S594135 | Wash Room # 15 | 2" | Date 09-03-14 Time 4:00 | Date 09-06-14 99 % 72 °F | Date % °F |
| \$593815 | Corridor # 16 | 2" | Date 09-03-14 Time 4:10 | Date 09-06-14 H: % 72 °F | Date % °F |
| | | | Date Time | Date % °F | Date % °F |
| | | | Date Time | Date % °F | Date % °F |

* All locations from existing floor plan

NH MA ME CT VT RI

JOHN TURNER CONSULTING

CONSULTJTC.COM

66 SOUTHGATE STREET WORCESTER MA 01603 T 508.505.0126 6 CLINTON AVENUE WESTFIELD MA 01085 T 413.642.0138 4775 ROUTE 14, UNIT 3 WRJ, VT 05001 **T** 603.234.0850 73 RAINMAKER DRIVE PORTLAND ME 04103-1291 T 207.883.7878



REPORT OF VAPOR EMISSION & ALKALINITY TEST (ASTM F1869)

CLIENT: City of Worcester, MA Department of Public Works 50 Skyline Drive Worcester, MA 01605 Attn: Mr. Christopher Adcock **PROJECT:**

2 Coppage Drive Worcester, MA

14-10-000114-001

| DATE: S | September 6, 2014 | REPORT #: |
|--------------------------|---------------------------------|------------------|
| Field Representat | tive: Dave Grodan | |
| General Location | : Slab on Grade, New Proposed 1 | Layout |
| Date Placed: | 09/03/14 | • |
| Date Read: | 09/06/14 | |
| Interior Tempera | ture: 72°F | |

| Location of Test | Start Wt. | End Wt. | Moisture Content | Specification | pH Booding |
|--------------------------------|-----------|----------|------------------|---------------|---------------|
| | (grains) | (grains) | (105/1000 11) | | Keauling |
| Conference Room #03 | 29.9 | 32.0 | 3.58 | | 10.0 |
| Open Office #04 | 30.0 | 31.6 | 2.79 | | 11.0 |
| Supply #05 | 29.9 | 34.2 | 7.52 | | 13.0 |
| Briefing Room #06 | 30.1 | 32.5 | 4.21 | | 11.0 |
| Briefing Room #06 | 30.1 | 34.9 | 8.5 | | 11.0 |
| Lunch Room #07 | 30.0 | 32.5 | 4.39 | | 10.0 |
| Lunch Room #07 | 30.0 | 31.8 | 3.25 | | 12.0 |
| Men's Room #01M | 30.0 | 32.3 | 4.07 | | 12.0 |
| Men's Room #01M | 30.0 | 34.4 | 7.79 | | 13.0 |
| Communications Room #16A | 29.9 | 32.4 | 4.44 | | 10.0 |
| Communications Room #16A | 30.0 | 33.2 | 5.7 | | 12.0 |
| Communications Room #16A | 30.0 | 31.4 | 2.5 | | 11.0 |
| Communications Room #16A | 30.1 | 31.1 | 1.97 | | 10.0 |
| ECC Operations & Training #014 | 29.9 | 30.9 | 1.8 | | 11.0 |
| Office #12 | 30.0 | 31.6 | 2.88 | | 10.0 |
| Director #09 | 30.0 | 31.3 | 2.34 | | 10.0 |

Sheet A1.1 referenced for test locations

NH MA ME CT VT RI

JOHN TURNER CONSULTING

CONSULTJTC.COM

19 DOVER STREET DOVER, NH 03820 T 603.749.1841 F 603.516.6851 66 SOUTHGATE STREET WORCESTER MA 01603 T 508.505.0126 6 CLINTON AVENUE WESTFIELD MA 01085 T 413.642.0138 4775 ROUTE 14, UNIT 3 WRJ, VT 05001 T 802.295.1100 73 RAINMAKER DRIVE Portland ME 04103-1291 T 207.883.7878